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FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

Volume . . . XIII
Number . . . 10

OCTOBER . . . 1938

Plant and Machinery Number

SUBSCRIPTION

Single Copies - 1/-
Annual Subscription
12 Issues - - 10/-
Foreign - - 12/6

Published on the first day of the Month by
LEONARD HILL LIMITED
17, Stratford Place, London, W.1
Telephone: Mayfair 7383
(Private Branch Exchange).

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

CONTENTS

	PAGE
Editor's Comments	323
English Canning Equipment. *H. D. Gregson*	327
Canadian Fruit and Vegetable Canning. *E. J. Thomas*	330
Dispersing Agents as Stabilising Media in Baking Powders. Part. II. *Simon Mendelsohn, Ph.C., F.A.I.C.*	333
Mixing in the Food Industry *William C. Peck, M.Sc., M.I.Chem.E., A.I.C.*	337
Plant and Machinery Review	343
British Food Research in 1937	351
Rapid Reviews	353
News from the Industry	355
Information and Advice	358
New Companies	359
Trade Marks	359
Recent Patents	360

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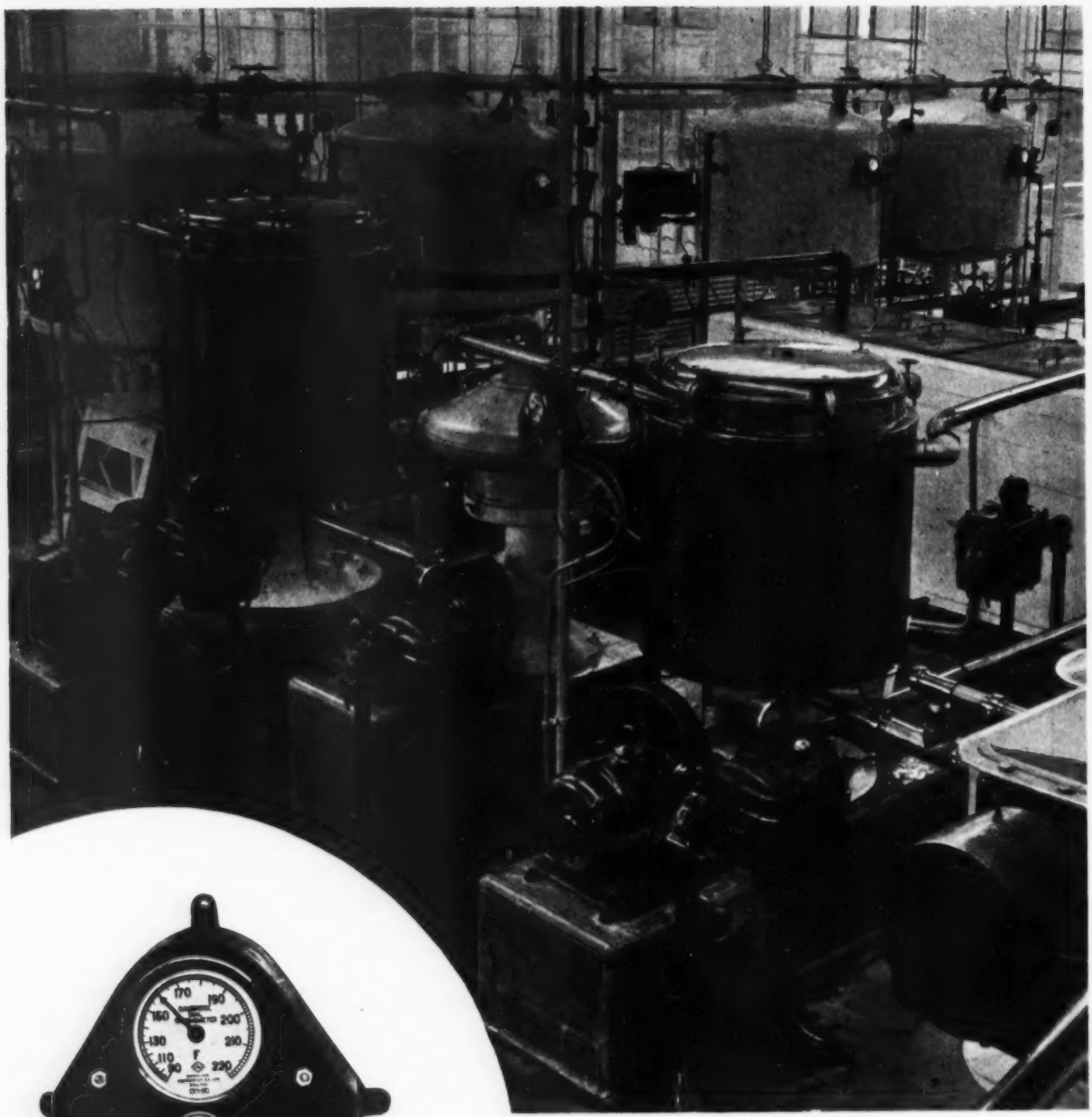

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FOOD MANUFACTURE

Vol. XIII, No. 10 October, 1938

Tears

"THE SAGE'S and the poet's theme, In every clime, in every age" has been sung of the tear. Samuel Rogers even appealed to the chemists about it—thus:

"Oh, that the chemist's magic art
Could crystallise this sacred Treasure. . . ."

Chloe's eyes have, for ages past, glistened with tears of sorrow and joy and also with tears . . . from onions.

The "magic art" has evolved "lachrymators" to wage wars and to disperse mobs, but according to E. F. Kohman's paper, presented to the American Chemical Society at Milwaukee, Wisconsin, while mankind has been shedding tears over onions since time immemorial, the chemistry of this lachrymating principle is still a mystery. Dr. Kohman's paper is a preliminary report of an investigation to meet this challenge.

First of all it has been established that there is no relation between the relative lachrymating effect and the flavour strength of the onion. Again, the demonstration of an aldehyde in the vapours of the onion explains their bactericidal property. Even if it is not so very important to know exactly what produces the tears, the discovery of this fact will encourage the onion's use as a remedy for the common cold. The investigation also suggests other considerations which may prove of practical value. There is a tendency to ascribe any change that takes place in a broken raw plant cell as due to enzymic activity. We have (says Dr. Kohman) evidence of far-reaching changes taking place in certain constituents of the onion cell after removal of all enzymes. It is entirely possible that many changes that have been ascribed to enzyme activity merely represent spontaneous breakdown. The plant cell is a synthetic factory building up free-loosely-bound energy. When this factory breaks down, what is more natural than that some of its products break down as a result of this energy with which they are endowed?

The Factories Act

The Annual Report of the Chief Inspector of Factories is always interesting and enlightening, but the one for 1937 is especially so, in view of the new Act now in operation. The Chief Inspector, Sir Duncan Wilson, states that the Act is a striking innovation in factory legislation. In previous Acts the elasticity, which is essential, in view of the enormous variety of conditions to be provided for in one single Act, has chiefly been secured by framing the requirements in general and sometimes extremely vague terms. In the new Act, for the first time, an alternative method has been extensively adopted. The requirements embodied in it, especially in the section relating to safety, have been made precise and detailed and the necessary latitude has been attained by conferring extensive powers both of exemption to meet instances where their rigid application would be inappropriate and of imposing additional restrictions where these appear to be called for. This method imposes both higher responsibility and greater powers on the Secretary of State and his advisers, and Sir Duncan Wilson considers that its acceptance by Parliament is a "striking tribute to the confidence felt by industry that these responsibilities will be fulfilled and these powers wisely exercised". The changes embodied in the new Act are both numerous and complex and to secure its complete working must necessarily be a gradual process. The Report states that the inspectorate will not press employers unreasonably, when they have a good excuse for delay and are making every effort to comply as soon as possible. Compliance with the Act will involve industries in considerable expenditure, but it is believed that the ultimate effect must be to raise the general standard of health, safety and welfare to a higher level than may be at present realised.

The Report and the Food Industries

Actually there is very little of vital interest as far as the food trades are concerned. The total number of accidents was 192,539, of which 1,003 were fatal, an increase of approximately 9 per cent. In confectionery, with which is coupled groceries, two men were killed and 935 injured; 624 women were injured, 176 boys and 467 girls were also hurt but none killed. One of the two fatalities was due to an explosion, the other to a falling body. The

figures for the number of two-shift orders given during the year are interesting. During 1937 there were only 126 two-shift orders granted, against an average of 266 in the years 1931-36. Miss Taylor, a deputy chief inspector, states that the compulsory secret ballot is partly, if not wholly, accountable for this decline. The law now is that in factories where women and young persons have hitherto been employed only on day work there can be no change to a shift system unless it is approved by a secret ballot of the employees concerned.

One point of interest to the food industries is the part of the report relating to dermatitis. The number of voluntarily reported cases reached the highest figure yet recorded. There were 1,985, including 47 recurrent cases, against 1,771 in 1936. Bakers and confectioners accounted for 75, sugar confectioners for 48, biscuit workers for 36, fruit preservers for 20 and sugar refiners for 15. It must not be thought that the food industries are the biggest offenders in this respect—the engineering trades have 252 cases. We strongly advise all food manufacturers to peruse this report carefully. It is very interesting.

That Apricot Jam Again!

There is something Gilbertian about much of our food legislation. The apricot jam case at Dover, to which we referred last month, is a typical example. The local authorities seized a sample of jam and the borough analyst found 140 parts per million of sulphur dioxide. The shopkeeper sent a duplicate sample to another analyst, who found only 40·6 parts of sulphur dioxide. The case was then adjourned for the Government chemist to have a go. In due course he reported 44 parts per million. The regulations allow 40 parts, but, in view of the difficulties of sampling and testing, a tolerance of plus or minus 10 parts would probably be allowable. The explanations for the discrepancy in the analyses were amusing. It was suggested that in the Government chemist's two samples the sulphur got oxidised and disappeared or, alternatively, all (or most) of the sulphur dioxide, for some mysterious reason, had congregated itself in the part of the sample which went to the borough analyst, disdaining the other two samples, which should have been absolute duplicates. We cannot believe that in a properly taken sample, sealed in a suitable container, any oxidation would occur to account for such a big reduction in the SO_2 content. This state of things is a scandal. Genuinely honest manufacturers are being subjected to the stigma of police-court proceedings without sufficient reason. It would be advisable in all such cases where one analyst finds a figure beyond the prescribed limit to have an outside analysis before prosecuting. As it is the authorities have been made to look silly. The really master touch about this is that, although the manufacturers were completely vindicated and the case dismissed they were ordered to pay the cost of the Government chemist's analysis. One would have thought that those responsible for bringing up the case on insufficient evidence would have had to pay that.

Bacon Factory Methods

The Bacon Development Board, on the instructions of the Bacon Industry Act, is faced with formulating a scheme for the rationalisation of the curing industry within a limited time. The Board would be well advised to study carefully the bacon industry in Denmark before finally deciding on the new plan. The facts are astonishing. Denmark has only 84 bacon factories, but these, last year, dealt with 3,699,869 pigs—an average of 44,046 per factory. Britain, on the other hand, has 622 registered factories and on the first contract under the new Act they may cure 2,100,000 pigs—an average of 3,376 per factory. The weekly throughput per factory in Denmark is 855 pigs—here it is a mere 65. Can anyone wonder that curing costs and overheads per pig are much lower in Denmark than in Britain? Danish factories are built of a size suitable to the area they serve. Some have a throughput of 222,182 pigs; others only 13,437. In Denmark the price paid to the farmer is tied firmly to the price of bacon on the London market. Here the price of bacon pigs is quite independent of the price of bacon. Sixty-two of Denmark's factories are distributed throughout the country on co-operative lines owned by the farmers themselves. Every Danish farmer produces pigs, and no producer is more than 16 miles from a factory. In this country we think nothing of sending pigs from Cornwall to Yorkshire to be cured and back to Devonshire again to be eaten. As we have pointed out before, a large number of our factories must be scrapped and the country divided into definite areas of production, each equipped with a suitable-sized factory. Wasteful overlapping and the sending of pigs unnecessary distances must be eliminated.

Milk Prices

Everyone's attention has been fixed on milk prices. Even Mr. Harold Nicolson preferred milk prices as a topic rather than Czecho-Slovakia in his talk the other night. Superficially the terms

arranged for the next year's milk control appear reasonably satisfactory. They provide a rise of 4d. per dozen gallons on the terms paid last year and bring the total monthly prices to the same as for the present year, including the increase of 4d. in July. The housewife will forgo the benefit of the lower summer prices but is promised the avoidance of high winter prices. The milk situation is rather precarious. We have passed through abnormal weather this spring and summer and we have seven months to be negotiated before the full effects of the past summer will have been overcome. The hay crop is one of the lowest on record—two and a half million tons less than last year; that is, about a ton short per cow. This means a heavy increase in the cost of feeding stuffs, an increase which will be much greater than the normal value of the missing hay. For these reasons, and anticipating high provender prices, milk producers are disappointed at the settlement, but it may be that a decrease in "manufacturing milk" will make the pool prices relatively higher. The producers may be disappointed, but neither are the consumers pleased. The one advantage seems to be the tendency towards level retail prices.

Potato Parleys

The Public Inquiry conducted by Mr. C. T. LeQuesne concerning the proposed powers of the Potato Marketing Board closed on July 30. The Inquiry was adjourned and transferred to Edinburgh for further deliberation on September 20. At the time of writing we do not know what the final decisions will be, but it has been very interesting to see how the various industries whose territory would be trespassed on if the proposals were ratified jumped to a fierce defence of their own real or imaginary rights. The flour millers resisted the manufacture of potato flour as it might be used for making bread and so rob the millers of a proportion of their own output. Sugar refiners objected to the manufacture of glucose from potato starch. Distillers resisted the suggestion of alcohol being made from potatoes. Those firms who have already been canning potatoes demanded a virtual monopoly by opposing the Board's proposal to can its own potatoes. The Food Manufacturers Federation stated that the proposals offered direct interference with existing established commercial trading and that the present capacity of the industry for the efficient and economical production of the commodities was ample to meet all the requirements of the market. At the present moment everything seems very involved, and we await with interest the further developments in the problem.

Food Storage

Whether food stored by modern methods, such as cold storage, gas-storage and canning, is as nutritious as fresh food is a question which has occupied the attention of those concerned for some time past. This question has closely touched the work done by the Food Investigation Board, but, according to its recently published report for the year 1937, it is one on which it is not competent to pronounce.

The matter was therefore referred to the Medical Research Council, whose verdict is that "there is so much to be learnt about food and nutrition that it is impossible, in the present state of knowledge, to state categorically whether or not stored foods are as nutritious as fresh foods. Nor is it feasible to undertake research with a view to answering this question directly. Many years of intensive work on large groups of human beings would be entailed, and even then there would be little prospect of arriving at a definite decision, for, with further knowledge of the effects of dietary factors on nutritional processes, it would be found that the results of the first year's studies would have to be reconsidered in the light of fresh evidence. Nevertheless, useful information can be obtained by comparing the chemical composition of stored foods with that of fresh foods, and the general conclusion can be accepted that relatively little loss of known constituents occurs in foods stored by modern methods. Moreover, experiments have been carried out on animals in which satisfactory nutrition has been maintained with diets composed solely of stored foods. The available evidence therefore suggests that modern methods of storing foods cause little depreciation in their nutritive value; in fact, it may be said that food of good initial quality that has been stored by the best modern methods is likely to be superior in many respects to similar food that, though still technically fresh, is in reality stale. One substance of important biological significance, especially associated with fresh fruit and vegetables—namely, Vitamin C or ascorbic acid—is well known to be easily destroyed by heat, applied either in ordinary cooking or canning; to a lesser extent, Vitamin B_1 is liable to be similarly affected."

A necessarily non-committal pronouncement, with little hope offered for illumination on this important question in our lifetime. In the meantime, food stored in various ways is being increasingly consumed, and no doubt in a generation or two its effects will be made manifest in the majority of the community.

Canned Foods

The Canning Conference is nearly upon us once again and we shall probably hear the old familiar plaints about lack of canned food propaganda and misdirected canned food propaganda and then go home and forget all about it until next year. Things are, perhaps, not quite so bad as that. It cannot be denied that some ground has been covered. Janet Bond, of the Canned Foods Advisory Bureau, has recently sent out to thousands of housewives a series of bulletins about canned foods. Last month we reviewed a nice little bit of French propaganda which in some ways was novel. There was a neat comparison between the cost of a dish, for four people, of fresh and canned peas. We do not remember having seen the advantages of canned foods tackled from this angle. True, there was just a little bit of hitting below the belt which would have been best omitted. Lettuce and onions (fr. 1.75) are charged up to the fresh peas and omitted in the canned peas account. However, the point is a small one.

British housewives as a body are not analytical and would probably say, "What's a little more or less gas, anyway?" But 33⅓ per cent. saving of gas in a moderate sized household may, at the end of the quarter, represent a new pair of gloves or even shoes.

The canning industry, by the amazing industry of its research chemists, has been delivered from the vitamin-loss bogey, nor are the words ptomaine poisoning and the like heard in the land. It still suffers from the cynical observations of those moralists who glibly condemn the employment of the can-opener as a kitchen tool and who forget that there is as much scope for artistry of the culinary sort in the contents of a can as there is in fresh produce.

Quick Freezing

Enzymes are problems which confront the quick freezers of vegetables. Proper blanching treatment as well as proper storage temperatures are vital factors in obtaining a satisfactory product after any appreciable time in storage. According to Dr. Tressler, at the Conference on Food Preservation at the Pennsylvania State College last June, storage temperatures of −40° F. are necessary if frozen vegetables are not properly blanched to inactivate the enzymes. Storage temperatures depend upon the length of time during which the goods are to be held and also on the adequacy of the blanching treatment. After six months in storage the goods enter a very critical period where improperly processed goods will deteriorate very rapidly.

There is still a lack of knowledge of the nature of the enzymes responsible for the deterioration and changes of flavour in underblanched vegetables. Nor, according to M. A. Joslyn and G. L. Marsh (*Food Industries*, August, 1938), is the nature of the changes of flavour known. These investigators summarise their conclusions as follows. The scalding period for vegetables should be long enough to inactivate enzymes responsible for deterioration, yet not long enough to soften the texture. In the case of peas, whose flavour is particularly susceptible to injury by heat, this can be best done by blanching slightly under 212° F. rather than by a short blanch in boiling water. The qualitative test for catalase inactivation may be deceptive in determining the blanching period for peas and is not applicable to all products. The peroxidase test may be used as an additional index of proper blanching in some cases. And, finally, the phenolase test for vegetables that discolour is the most definite index of adequate blanching.

Canning Problems

Day by day, for a long time past, we have been adjured by certain sections of the daily press to abstain from poking our noses into other people's troubles, mainly political ones. But apart from the obvious advantages to be gained by an intelligent study of other people's difficulties, in its lowest analysis there may be a rueful sort of consolation in knowing that other people have exactly the same difficulties as ourselves. In many forms of social activity does this hold good. Who has not swapped bodily symptoms with a fellow-sufferer, and felt better for it?

The application may be found in the canning industry, and in June last, we published an article entitled "What's Wrong with British Canning To-day?" In our present issue, Mr. E. J. Thomas discusses Canadian canning problems which differ from ours more in degree than kind. Both authors stress the difficulties and a certain lack of harmony between the growers and the canners. Co-operation and common counsel seem to be the magic words not only as between canners and growers but between canners and canners. The matter is a complicated one, and although in Canada new legislation would appear to favour the grower in his attempt at collective bargaining, it is looked upon apprehensively by the canners. Nothing of this kind has been attempted in this country up to the present, and we feel that with an increase of goodwill on either side, the solution of British canning problems should be found.

H. D. Gregson

expresses some opinions on

ENGLISH CANNING EQUIPMENT

[*Courtesy, Wm. P. Hartley, Ltd.*

A Canning Factory.

THE PRESENT usual canning layout consisting of a long bench with a central belt or wire rope, with or without empty cans travelling overhead and finally supplying a syruping machine, is fundamentally wrong for the majority of English fruits. The premise of not handling fruit if at all possible is fully borne in mind when this statement is made. English fruits requiring little or no handling except to remove defects are gooseberries, loganberries, raspberries, cherries, blackcurrants, and blackberries. Fruits that require some handling for plugging purposes are plums and damsons. The only fruit that requires extreme handling is the strawberry.

Practically every cannery is laid out with the sole idea of handling this latter fruit as cheaply as possible —at the expense of all others—and I venture to suggest that even this could be handled more cheaply. It may rightly be said that cherries also require strigging. At present this is correct, but at least two mechanical striggers are on the market, and although not yet entirely satisfactory, it can only be a short time before they have been adapted to English conditions and costs.

Peaches—The Model

The English canner has probably adopted this straight picking table principle because of the American system of filling peaches, but the fundamental difference between packing English fruits and peaches is that the latter have previously been machine graded, peeled or halved, but still require some further attention before filling and also require packing into the can to get an adequate fill (peaches being cheaper than sugar), so that the bigger the fill of fruit the greater the saving on sugar. In the case of those English fruits first mentioned, the opposite applies; the fruit is dearer on average than sugar, and it is not necessary to pack the fruit in to get a filled can. It is certainly true also that the less such a fruit as a raspberry or loganberry is handled the better. Why, then, handle it at all?

The Travelling Belt

Surely the better system would be to allow the fruit to pass on a travelling belt, from which only the defective fruit is picked, and then to fall lightly into cans at the end. Gooseberries are at present machine graded, snibbed and washed so that only defective fruit need be hand-removed, leaving the rest to be filled very easily into cans from a rotating can filler. In a normal sample of fruit the percentage of defective material is small.

Currants are machine strigged, and although not always perfectly done there seems little reason for handling the fruit except to remedy the lapses of the strigger. Loganberries and raspberries are spoiled by handling and, again, only those which are broken, unstrigged or in other ways unsuitable need be touched by hand, leaving the balance to flow into cans. Several canneries have already adopted this system for these fruits. Cherries, which have already been mentioned, should be machine graded after strigging, and may be

far more easily sorted for quality on a travelling belt than by hand.

Individual Handling

The fruits that require individual handling are strawberries, plums and damsons, which can be strigged faster and then graded than by attempting to do both processes in one operation. This applies particularly to strawberries. The strigger or plugger rapidly gets her hands sticky with juice, and unless great care is exercised portions of strig adhere to her fingers and from there become stuck to the moist fruit, so that even though she has done her job properly the result is imperfect. It is an axiom that the fewer different jobs a girl has to do the faster and more perfectly she will do them, and by limiting the first part of strawberry canning to strigging only, followed by grading with another girl, both jobs will be done individually quicker and better.

Plums and Damsons

The same applies to plums and damsons, except that in the interval between strigging and filling an opportunity occurs for mechanical grading for size. I have dealt at length with a system of fruit preparation as this is a fundamental consideration in canning conditions, and its machinery. Graders are at present in existence for dealing with all the above fruits that will stand handling, but the ideal grader is one that can easily be changed over and yet at the same time will handle a large tonnage of fruit per day. It must also be easy to clean and preferably of an acid-resisting metal.

Washing Fruit

Very few fruits are washed before canning—gooseberries, where it is involuntary and complementary to snibbing, are one exception—but no cannery so far as I know employs the flume system for the conveyance of gooseberries, cherries, plums or damsons from the automatic graders to the sorters or fillers. To wash raspberries is impracticable, but strawberries, as is proved when the syrup is examined, yield a far brighter product when washed, and loganberries, if washed, will usually be quite free from maggots. Accordingly, some simple form of washing apparatus is indicated, as an adjunct to the sorting belt over which the fruit should be travelling.

Weighing

After filling, every can should be weighed mechanically and, at the same time, quickly. While it is common practice to fill every can to within the prescribed National Mark tolerances, which allows a difference of weight of from 10½ oz. to 12 oz. per A 2 strawberry, there is too great a difference where terms of colour or sweetness are concerned. What chemist would tolerate a difference of 1½ oz. in a total liquid weight of 10 oz. or 15 per cent. variation in colour in, for example, table jellies? The same applies to sweetness, and some quick, reliable and easily changeable method of automatic weighing would certainly be included in any ideal cannery, although a five-year search has not brought to light such a machine.

Syruping

After weighing, with the rejection of all those cans that are under or over weight, the syruper is reached. There are several forms of syruper on the market, but none that prevents wasps hovering round (and probably getting canned!), none that avoid spill and drip and none that maintain an even temperature in the syrup. Cans may be coming through quickly, and the syrup reservoir is constantly filling up with fresh, hot syrup; but when cans are coming through slowly the syrup will either cool and so affect the ultimate vacuum, or overheat, concentrate in colour and density, and similarly affect vacuum, colour and sweetness of the finished product.

At least one type causes crushing of the top plums or gooseberries if the National Mark fills are attained, and few are easy to clean properly. Clinching or seaming may safely be left in the can-makers' hands, and it is strange to note that the most intricate machines in the whole canning line are usually the most efficient, positive and trouble free, once they have been set up. The only defect lies in the code marking and lid feed, and it is a pity some less dangerous method than embossing or stamping the lid cannot be discovered.

Exhausting

Exhaust boxes are many and various. The more expensive they are the more labour there seems to be attached to them in changing from one size of can to another, and no quick method of altering their speed has yet reached my attention, although a set of gears to give an exhaust of, say, 15 minutes for a cherry to 5 minutes for a gooseberry would be very acceptable, provided the holding capacity in the former case would still keep the line running at full output.

Cooking and Coolers

Cookers or coolers still leave a lot to be desired. It is still possible to have a large breakdown due to cans getting bent and jammed in transit, and rarely is the size of the cooler sufficiently adequate to reduce the internal temperature of the cans in the allotted time to a safe figure when running to capacity. Furthermore, considering that the whole operation merely consists of immersion of cans in boiling water for a few minutes, and then in cold water, the cost seems to be excessive and the machinery ponderous in the extreme.

I am always surprised that steam has not replaced water and that the conveyance of cans cannot be straightforward instead of rotating. It would then be possible to have the whole cooking process mounted off the ground or suspended from the roof and a big reduction in plant cost made possible. Assuming a cooker and cooler to cost about £1,000 with a useful operating period at an average of 50 per cent. efficiency (and this

is a very high figure indeed) for the months of July and August, with a standing cost of 15 per cent. depreciation and 5 per cent. interest on capital, this represents a charge of £200 in the year of purchase. The same £200 could buy two tanks for cooking and cooling, with a mechanised power hoist plus two men for two months, and be foolproof and leave the canner his capital intact. Furthermore, it could be used for any size and shape of can with equal efficiency and a corresponding saving on coal and power. An automatic cooler and cooker ought to be equally flexible, not limited to one size of can. This is another heritage from the United States, where labour is dear and straight runs of fruit are more usual than in this country, where a fruit canner frequently deals with five fruits in one day, all requiring different periods of cooking and cooling.

Vegetable Plants

With vegetables, especially peas, more plant seems to be required than with fruits, and the whole layout is completely different, in that all require blanching and washing at some stage in their career and none are palatable in a raw state.

It is interesting to note that peas, after preparation, are not treated as are mechanically prepared fruits such as gooseberries, but are allowed to travel along belts for a final inspection and removal of foreign matter and faulty peas. Surely what is right for one should be right for the other?

Peas

Peas should be graded not only for size but also for quality or ripeness, and there is certainly room for an automatic high-speed quality grader, as by sorting over-ripe and under-ripe material two faults which at present exist would largely be avoided.

The texture of a canned pea is largely decided on the period of blanch, but at present an average blanch results in some peas being slightly mealy and some, at the other end of the range, being so softened as to break in the process and cause husks only to emerge, the tender centre having disappeared in the water.

Incidentally, a machine or attachment to the blancher to eliminate husks of immature peas efficiently is also much needed.

The present type of pea filler is also imperfect. It not infrequently fails to fill an even weight of peas, with the result that some cans will be over-coloured by an excess of brine and a disappointed customer receive short measure.

Other Vegetables

French beans are a different proposition from peas. Generally speaking, they are handled too much, unless there is a budget for a very large output and a consequent installation of expensive machines. If a simple machine exists for snipping the ends off beans I have yet to see it, and a cheap efficient blancher is also called for but not as yet forthcoming. Considerable hand labour is required to pack beans when canned whole, especially if adherence to correct weights is maintained; here again a high-speed filler would pay if the output was a large one.

A suitable filler for spinach is needed. The machinery available for cleansing and packing other vegetables such as carrots, beetroots and potatoes is efficient, although the output per machine is very limited.

Wanted—An Inventor

I now come to the great want of the fruit industry—a strawberry strigging machine. All over the world this is one of the most popular fruits for jam as well as canning, and wherever it is grown there must be found thousands of hands strigging during the short season.

If a French widow can discover a suitable method of shelling peas by machine it is high time someone else invented a machine for removing the strigs of the most popular of our fruits, and I look forward with pleasurable anticipation to the cannery of the future in which the provision of adequate labour for a short two or three weeks per year is not an annual bugbear. Similar difficulties are being overcome in hop picking by the introduction of machinery, and with the increasing cost, apart from shortage of labour, a strawberry strigging machine must soon become a necessity.

Golf for Canners

ARRANGEMENTS are being made to hold the FOOD MANUFACTURE Golfing Meeting during the Canning Convention. It is tentatively arranged that the morning shall see the playing of the medal competition (stroke play), with the FOOD MANUFACTURE Challenge Cup and Replica as second prize. Full club handicaps are allowed. Best net score returned by a player with a handicap between 18 and 24 who does not win the cup gets a special prize presented by W. P. Hartley, Ltd.'s, Liverpool Works Manager, Mr. T. W. Winterson. A four-ball foursome bogey competition will be played in the afternoon. Prizes for the winning pair will be presented by Jarman and Cowley, Ltd.'s, Mr. L. Birkett, who won the FOOD MANUFACTURE Cup last year. Optional sweepstakes will be organised both morning and afternoon (2s. 6d. per head). The winners will be those returning scores next best to actual prizewinners. Full details of all the foregoing tentative arrangements will be circulated later.

Mr. Maurice Batchelor, who is associated with Mr. W. Leonard Hill in the organisation of this annual event, has said that he hopes the friendly character of the meeting will continue to be its distinguishing note. It is not intended to be a tigers' competition, but rather an opportunity for those whose business interests are associated to get together in an informal fashion. If they care to swop experiences and opinions on business problems between golf stories, so much the better.

The Sweet Show

THE Chocolate and Confectionery Exhibition was one of the best-organised shows in the food industry. Full details of the Exhibition were given by our contemporary, *Food Industries Weekly*, in a recent issue, and in the course of a leader the question is asked, "Is the Sweet Show in danger?" There appear to be two alternatives—one, to reduce costs and to make the show one which will cater exclusively for the trade, or, if it is still desired, to continue expense on a luxury scale. Fuller value could be got if the occasion were used for propaganda appealing to the public and inducing the public to attend in greater numbers.

CANADIAN FRUIT AND VEGETABLE CANNING

E. J. Thomas

THE CANNING of fruit and vegetables on a commercial scale, although one of the younger, is now one of the most vigorously thriving branches of the food industry in Canada. The most outstanding aspect of its history is its rapid development in the past decade; in the fourteen-year period of 1923 to 1936 volume production of the industry increased by 200 per cent. Official statistics, however, provide the clearest idea of the progress achieved. These show that at the turn of the century the value of all canned foods, including fish, meats, milk, fruit and vegetables, produced in the Dominion was about £1,707,000.[1] By 1930, the year's production was valued at £11,044,000, while in 1935, the most recent year for which complete figures are available, the gross value of production reached nearly £14,458,000. Of this total, the canned fruit and vegetables industry alone accounted for £7,706,000, or approximately 63 per cent. of the whole.

Demand—Satisfactory

Side by side with the growth of the industry the domestic demand for the canners' product has risen in a most satisfying manner. There are a number of factors, of course, which contribute to this ready acceptance, chief of which is the fact that the Canadian housewife has been educated to depend for climatic reasons on preserved foods in some form or another for the greater part of the year. Add the high standard of living she generally enjoys, with its consequent demand for greater leisure in the home, to the improvement of the canners' product in relation to price, quality and reliability—failures due to bacterial spoilage are currently claimed to be less than one-tenth of 1 per cent.—and it is easily seen why she is one of the foremost wielders of the can-opener in the world.

Wide Range of Packs

Chiefly carried on in the provinces of British Columbia, Ontario and Quebec, the fruit and vegetable canning industry handles an imposing variety of products. Fruits include apples, pears, peaches, plums, cherries, rhubarb, gooseberries, blueberries, raspberries, strawberries and two specialities of British Columbia—the apricot and loganberry. At the head of the list of vegetables is the pea, of which, last year, the pack amounted to over 1,800,000 cases. In close competition to it comes that favourite, the tomato, in its several forms of juice, pulp, purée and paste, as well as the whole skinned article. In 1935, it may be noted, no fewer than 18,000,000 lb. of tomato juice and 89,000,000 lb. of other tomato products alone were canned in Canada. Other of the principal vegetables processed are creamed and cob corn, beans, beets, carrots, pumpkins and squash, asparagus and spinach.

Canning Procedure

The various stages of preparation, processing and packing proceed along lines broadly similar to those generally practised in the United States and England. Briefly, the preparation of the article to be canned involves such operations, with various modifications in certain circumstances, as the usual preliminary screening, washing, trimming and peeling, inspection and grading. Then, when the cans have been automatically filled the contents are covered with syrup or brine as required and exhaustion of air effected either by vacuum or by heat treatment immediately prior to sealing. Cooking, which may be done in boiling water, or, in the case of non-acid products, in closed retorts at higher temperatures, is proceeded with for a period

Grading Canadian Apples.

(This and the other pictures in this article are by courtesy of the Dominion Department of Agriculture, Canada.)

[1] For the purpose of illustration these figures from the Bureau of Statistics at Ottawa have been reduced from Canadian currency to sterling at par ($4.86) to the nearest £1,000.

Every country has its canning problems. In our June issue British canning was discussed. Here the author tells of, "one of the most vigorously thriving branches of the food industry in Canada," which, however, has its particular troubles.

Canadian fruit orchards in blossom time.

depending in length upon the usual factors of the size of the can being processed, the rate of heat penetration and the thermal death point of the organisms normally present. Cooling by means of the water bath usually completes the process.

Scientific Research

The Canadian canner is as alive to the need for constant research on his products as any other. He is fortunate, though, in having the assistance of the Experimental Stations with their embodied Fruit Products Laboratories of the Dominion Government. The help rendered by these has been invaluable to the canner, and the scope of their investigations, which embrace every relevant phase of fruit and vegetable preservation, is surprisingly wide.

There are three of these stations, located respectively at Kentville, Nova Scotia, in the heart of the Annapolis Valley, the second situated centrally at Ottawa, and the third at Summerland, in the fertile Okanagan Valley district of British Columbia. Some of the recent work of these stations and its relation to the well-being of the Canadian canning industry is interesting.

Seasonal Difficulties

One of the basic difficulties affecting the economics of the industry at large is the short and congested season with which the canner must cope. Practically all canning operations are carried on between the months of June and October, the peak production months being August and September. Consequently, the extensive plant required to handle the huge volumes of produce in a comparatively short time must stand idle or practically so for almost eight months in the year.

The alleviation of this condition by extending the season has been the object of much effort on all sides, and results, although unavoidably slow in appearing, are being gradually achieved. The introduction, last year, of the new "V" series of peach varieties serves handily for illustration. These fruits, literally, of the work of the Kentville Station are known as Vedette, Valiant and Veteran, are possessed of excellent canning qualities and mature ten days to two weeks earlier than the Elberta, which was formerly the first peach to receive the attentions of the canner. This development, which has resulted in less crowding between the peaks of the peach and tomato seasons, is of no small worth to the canner who, with a season of little more than four weeks, has to keep pace with the production, in Ontario for example, of an average of 650,000 bushels of this one fruit alone.

It is not too much to predict that developments similar to this extended to other produce lines might well lengthen the whole season by four or five weeks.

Canned Pears

The same station has made a valuable contribution to the betterment of the canned pear pack. The variety of pear known as "Clapp's Favourite" is extensively cultivated in Nova Scotia but is a notoriously poor canner. However, controlled conditions of storing and maturing, as worked out by station officers, has succeeded so well in improving the pack that already a vastly increased demand for this product has been noticed.

The Ottawa Experimental Station, situated as it is outside the areas of growth of canning crops, has given less attention to crop improvement than to problems concerning details of canning processes. An important phase of investigation concerns the tomato pack for export purposes. The present confused internal conditions of Italy and Spain, whose canned tomato products have hitherto enjoyed a fortunate position on the United Kingdom market, have given the Canadian product a chance to gain a "toe hold" in competition therewith. It is realised, however, that the shortcomings of the Canadian article, frequently criticised as being too watery and pale and failing in the case of the whole-skinned pack to stand up satisfactorily to processing, might well disqualify it when the European products return in normal volumes. With this in mind, a pack of peeled, small-fruited tomatoes has been evolved which compare favourably in every respect with the Continental type. The chief difficulty at present is the insufficiency of the

Canning cherries at the plant of Canadian Canners, Ltd.

seed supply, but another year should see this difficulty overcome.

Experimental Packs

Other work recently announced by the same station includes the experimental packing of the juice of the yellow tomato, the production of a variety of green soya bean with interesting canning possibilities, and an important development in the treatment of cans for holding troublesome acid products such as apple juice. This last consists of coating the interior of the otherwise untreated can with a light coating of mineral oil. It would seem that the obvious fault would lie in traces of the oil being both noticeable to the eye and the palate. Such was found not to be the case. Not only were flavour and appearance unchanged, but the metal, usually so readily reactant to the juice, was found to be untouched. The method still needs more thorough investigation, of course, but it is believed that the same treatment, or a modification of it, should hold possibilities with regard to other products of similar nature.

From the canners' point of view, the Summerland Station is chiefly engaged in tests of the suitability to soil and climate conditions of new fruit and vegetable varieties with good canning characteristics. An idea of the magnitude of these tests may be gained from the fact that there are 100 varieties of apples, 40 of pears, 50 of plums, 30 of peaches, 20 of cherries, 15 of apricots and 6 of raspberries at present under observation.

Beside this only partial picture of the work being done by the Government Stations in the interests of the canner, that of the canners themselves is apt to pale somewhat. Nevertheless, such work is being accomplished by them as well as by the can companies and other bodies interested in the industry. All aim at improving the pack as regards its general appearance and the retaining of the fruits' colour and flavour as well as the nutritional aspects. All in all, if effort expended is to be any guide to the future prospects of the industry, the presage is very fair.

Canners and Growers

One feature of the Canadian canning industry of which one is less confident is the relationship between canner and grower. Despite a noticeable improvement in recent years, they are not, unfortunately, all that they might be. The chief bone of contention, as ever, is the disparity between the price the grower expects for his produce and the price the canner, beset by the other costs he must meet and the price his product must fetch in the face of keen and sometimes cut-rate competition, feels he can pay.

In Ontario, at the time of writing, growers are being paid from 35 cents to 45 cents (1s. 6d. to 1s. 10d., approximately) per bushel of tomatoes for processing. This figure represents a voluntary increase on the part of the canner of, in some cases, 10 cents (5d.). On the other side of the picture comes the news that certain of the canners in the same province have cancelled their cherry contracts in refusal to meet the price of $5\frac{1}{2}$ cents per

"Canned in Canada" . . . the three grades under which Canadian canned fruits are marketed.

pound set for processing cherries. Such action, leaving as it does numbers of growers with a crop they cannot dispose of and the canner with an insufficient pack of this fruit, is anything but conducive to harmony between the two sides.

Again, a recently enacted amendment to the Ontario Farm Products Control Act is regarded by the canner as apprehensively—in that he sees in it the possibility of price fixing of produce and all it entails in the matter of the marketability of his product—as it is welcomed by the grower, who pins upon it his hope of establishing the right to collective bargaining.

Partnership

Obviously, mere legislation is not enough. Just as obvious, also, is the fact that the persistence of the present attitude toward one another is to the worst interests of the industry and to crop growing. Some improved basis for arbitration that will rub no sore places—better still, a *partnership*—between the two sides seems to be essential if the industry is to flourish as it could and should.

Dispersing Agents as Stabilising Media in Baking Powders

SIMON MENDELSOHN, Ph.C., F.A.I.C.

Part Two

POTATO STARCH has repeatedly proven inferior to corn starch for use in leavening compositions, the variations in efficiency of these media decreasing with increased particle size of the acid constituent. This was corroborated by Gallay and Bell,[13] particularly in the case of phosphate baking powders. Dried potato starch impregnated with hydrochloric acid, to be mixed with bicarbonate of soda prior to use, provided a leavening expedient in some parts of Europe during the World War. The combination is cited by Bennion and Stewart[14] as having been employed in the usual manner with moderate success, but it is evident that prolonged or negligent storage of the acid complement may prove conducive to deterioration coincident with hydrolytic interferences resulting in conversion of the starch to dextrose.

Rice starch is characterised by the smallest granules of the commercial starches, and theoretically should therefore be capable of affording more adequate coverage of leavening reactants than coarse wheat starch or potato starch. Fine wheat starch is directly comparable with rice starch in particle size, but the latter material, according to Gallay and Bell, is superior to corn starch in stabilising efficiency only under specifically stringent circumstances. Rice starch may frequently be adulterated with cheaper starches, and is frequently characterised by decided alkalinity if not properly manufactured. The presence of alkali is due to the use of caustic soda in softening the rice preparatory to grinding, so that in the case of the edible commodity the contaminant may impart a secondary and unpleasant taste, which, however, would not be of any consequence in baking powders. Within recent years the residual alkali content of rice starch intended for edible purposes has been reduced from 1·2 per cent. to less than ½ of 1 per cent.,[15] but, despite the improvement, the cost of this material still proves deterrent to its more extensive application. According to Cox,[16] rice starch and rice flour have been employed in some English baking powders on the assumption that the small, angular grains might be contributory to a more gradual and uniform distribution of CO_2 as liberated from the leavening mixture. Rice starch to serve as a stabilising agent requires careful re-drying, since its moisture content may amount to 12 per cent. even on leaving drying chambers in the final stages of its commercial production.

Magnesium Carbonate

The addition of magnesium carbonate[17] to baking powders was in past years, according to Hart,[18] a not infrequent practice for the purpose of contributing deceptive bulk. This substance is obtainable at reasonably low cost, bulks six or seven times as much as bicarbonate of soda, and is considerably slower in reaction with the customary acid materials. Magnesium carbonate imparts excellent keeping quality to baking powders, thereby serving as an efficient stabilising agent, but reactions between this material and the usual acid media yield innocuous, but generally unpalatable, residues. Summarily, the compound serves most efficiently to augment the dryness of leavening mixtures through reinforcement of this function as afforded by the common stabilising agents. Magnesium oxide (MgO), commonly designated as "magnesia", is employed to a very limited extent in baking powder as a stabiliser in conjunction with starch. Two examples of leavening preparations of American manufacture containing "magnesia" have thus far been noted; of these, one was of the phosphate type and the other a combination powder.

Calcium Sulphate

Calcium sulphate ($CaSO_4.2H_2O$), also designated as calcined gypsum or "plaster of Paris", has been accorded some degree of attention in its use in admixture with monocalcium phosphate in leavening mixtures.[19] From one point of view, the sulphate was regarded as a neutral, totally inert substance capable of serving as an efficient drying agent in conjunction with its alleged property of retarding evolution of CO_2, thereby rendering leavening action more gradual. Other opinions, to the contrary, maintained calcium sulphate to possess value as a reactant with sodium bicarbonate in the presence of acid phosphate. A special type of baking phosphate containing from 25 to 30 per cent. of added sulphate, and commercially designated as "sulphated acid phosphate", was formerly employed to some extent in baking powder manufacture. It is a matter of interest that monocalcium phosphate, neutralised with standard alkali in the presence of phenolphthalein, demonstrates a singular increase in acidity upon the addition of calcium sulphate. Such excess acidity can be determined by titration with alkali, or measured electrometrically, the latter procedure being more advantageous in that it does not disturb the equilibrium of the system. Patten[20] ascertained the addition of the sulphate to appreciably extend the limits of the proportions of sodium bicarbonate that could be used with stipulated quantities of acid phosphate without imparting an alkaline flavour to biscuits. The following transformations were adduced

through purely theoretical consideration of reactions between calcium sulphate, sodium bicarbonate, and acid calcium phosphate.[20]

Calcium sulphate has been assumed to react in dough in such manner that original identity of the compound cannot be verified on completion of the above leavening reaction. Instead of calcium sulphate as an entity, the material through recombination apparently yields soluble sodium sulphate and an insoluble calcium phosphate, $(CaO)_x(P_2O_5)_y$, of variable composition. With baking powders of high calcium sulphate content it is likely that the material as $CaSO_4$ or $CaSO_4.2H_2O$ may exist as a solid phase in connection with some calcium carbonate upon decomposition of the leavening mixture. Conversely, a low calcium sulphate content of a powder might result in what Patten assumed to be a solid solution in the residues after baking, the decomposition products containing some calcium carbonate along with CaO and P_2O_5 in quantities not necessarily in simple molecular ratios to each other.

The use of calcium sulphate as an added ingredient in American baking powders is unknown at this time, while occasional samples of powder of Mexican manufacture have been found to contain the substance, but with declaration of same borne on labels. Teller[21] in 1904 suggested an admixture of sodium bicarbonate and dried casein impregnated with hydrochloric acid as a leavening mixture, the protein to serve as a stabilising medium and simultaneously as a vehicle for the acid ingredient. Casein impregnated with phosphoric acid, or in admixture with an acid phosphate for use with an alkaline carbonate, was advocated in a patent issued in 1902.[22] Thatcher, in a later patent, recommended a leavening preparation consisting of an alkali-metal carbonate, cream of tartar, and lactose, the mixture to be intimately mixed with finely powdered casein. The protein in this case may, through natural acidity, act as an accelerator in the reaction between acid tartrate and bicarbonate of soda.

Casein

Casein has found some applications as a dispersing and stabilising medium in the preparation of baking powders intended for use in connection with diabetic foods wherein starch may prove objectionable. One such leavening mixture submitted to the writer for analysis consisted of cream of tartar, traces of tartaric acid, sodium bicarbonate, and casein. A phosphate powder consisting of—

	Per Cent.
Sodium bicarbonate	27
Granular acid phosphate	30
Casein	43
	100

was compounded, the soda containing 0·5 per cent. tricalcium phosphate as a stabiliser, and the casein being of an excellent commercial grade intended for food purposes. The preparation having been preserved in a tightly closed container for 18 months, the accumulation of free CO_2 in the can was sufficient to forcibly eject some of the powder when pressure was released through removal of the lid for the first time throughout this period. Assays for total CO_2 indicated this powder to have sustained a loss of 48·3 per cent., which degree of deterioration, despite protection against exposure, must be attributed not only to the 10 per cent. or more of moisture content, but to the slight acidity of casein as ordinarily available in commercial channels.

Coating of Ingredients

A coating of cellulose acetate or formate as a thin film on one of the active ingredients of a baking powder has been suggested as a means of assuring stability of the preparation.[23] Schott in recent patents recommended infusorial earth (kieselgühr), with or without flour, in chemical leavening mixtures consisting of potassium carbonate and an acid phosphate.[24] Patentee also suggested the use of lycopodium as an alternative to infusorial earth, or, in conjunction with this substance, to replace all or part of the customary amylaceous stabilising or dispersing agents. Lycopodium consists of a species of plant spores, and is available as a light yellow, very mobile, odourless, and tasteless powder containing a sugar and fixed oil; the particles, varying from 0·025 to 0·04 mm. in size, are not wetted by water.[25]

Tricalcium phosphate has found extensive application in the promotion of "free-flow" of commodities such as table salt, sugar, powdered milks, etc.,[26] and to a limited extent in bicarbonate of soda to prevent caking. The material, $Ca_3(PO_4)_2$, is frequently present in monocalcium phosphate, the association resulting in the course of manufacture of the acid compound. Its use as an added ingredient in baking powder, to obviate lumping, may be attended with a certain degree of suspicion in view of possible reactions that might be induced by the presence of adventitious moisture.

Moss[27] intimates the non-existence of pure tricalcium phosphate, $Ca_3(PO_4)_2$, in which form premature reactions may be possible. According to this authority, the so-called "tricalcium phosphate" in commerce is more basic than the theoretical form, and in the presence of monocalcium phosphate and water may tend to yield a certain amount of dicalcium phosphate, but no free acid. Moss further contends[28] that theoretically tricalcium phosphate, with water alone, yields a more basic calcium phosphate of approximate composition $3Ca_3(PO_4)_2.Ca(OH)_2$, the transformation being possibly accompanied by slight traces of acid.

"Stabilised" Bicarbonate

A non-hygroscopic granular sodium bicarbonate prepared by Strickler[28] consists of the alkali being coated with an efflorescent material—*e.g.*, disodium phosphate—as a stabilising agent when the bicarbonate is intended for use in baking powder manufacture. The "stabilised" bicarbonate so prepared is preferably granulated to 100-mesh fineness for use in leavening mixtures.[28] Horsford and Catlin[29] suggested the treatment of soda with a solution of magnesium sulphate to assure greater stability when the alkali was in admixture with the acid constituents of a baking powder. The consequent forma-

tion of a coating of magnesium carbonate (*q.v.*) in this instance was asserted capable of retarding premature chemical activity between the soda and associated acids, despite exposure of the mixture to dampness. Use of gum karaya in baking powders is a suggested innovation designed to effect economical reduction in the quantities of leavening gas ordinarily required for any specified bulk of dough or batter, the gum replacing in entirety the starch otherwise used in compounding a leavening preparation.[30] Subject to conditions imposed by an increase of dough viscosity, the very smallest bubbles of CO_2 are utilised for their cumulative contributions toward maximum efficiency of the system as a whole. Use of the gum is alleged by patentee to be conducive to a more porous product with greater volume for a weight of dough. Incidentally the technique would permit manufacture of stipulated sizes of a loaf with smaller quantities of flour and other ingredients. A variety of substances other than gum karaya may be utilised for the same purpose—*e.g.*, Indian gum, dextrin, agar, tragacanth, and gum arabic being conceded as being equally effective.[30]

Incorporation of a leavening mixture within a "shortening" of lard-like consistency was devised to afford stability as well as convenience, inasmuch as only flour and milk (or water) need be added to prepare a dough.[31] Atkinson[32] described a method for imparting an oil or fat coating to active leavening ingredients, the fatty matter constituting approximately 50 per cent. of the bulk, thereby replacing customary stabilising media and simultaneously acting to some extent as a "shortening" agent. Owing to these impervious coatings, the reactions between acid and alkali in presence of water could occur only upon application of heat.

Milk Powders

Within recent years the admixture of sweet milk powder and dried buttermilk solids with baking powders has proven efficacious towards enhancement of baking performance and concurrently to impart more salutary qualities to baked goods. Powdered buttermilk, together with its equivalents—*e.g.*, dried, cultured skim milk, etc. —have been suggested for total or partial replacement of starch and acid reactants in leavening mixtures.[33, 34, 35] Desiccated sour milks incidentally serve a twofold purpose —*i.e.*, affording free lactic acid within a concentrated bulk of substrate, which in turn acts as a dispersing or stabilising medium.

Wiley[35] suggested calcium carbonate ($CaCO_3$) in conjunction with powdered artificially soured skim milk, the carbonate providing CO_2 after having previously served as the stabilising agent in the leavening mixture. A substantially neutral calcium lactate, $Ca(C_3H_5O_3)_2$, also has been proposed as a twofold constituent, serving as an accessory reactant as well as a stabilising medium by separation of acid phosphate from bicarbonate of soda in mixtures in which these three ingredients are associated.[36]

Utilisation of 1 to 60 per cent. of neutral calcium (or magnesium) pyrophosphate ($Ca_2P_2O_7$) has been recommended by Weil[37] to serve as a stabilising agent and "filler" in baking powders. The compounds are alleged to appreciably reduce the free moisture content of a chemical leavening preparation through their ability of absorbing free moisture.

A recent patent describes a leavening mixture containing soy-bean meal to provide adequate bulk and concurrently serve as substrate for its urease content.[38] Patentees have utilised the enzymic reaction of urease in the meal upon carbamide—urea [$CO(NH_2)_2$]—to yield ammonia and CO_2 for leavening purposes, the NH_3 being cited[39] as imparting flavour-improving effects upon baked goods.

One can proceed indefinitely in the survey of literature concerning the diversified materials suggested as stabilisers, diluents, dispersing agents, or innovational constituents in leavening mixtures. Despite some of the novel features afforded to these preparations through intervention of proposed ingredients, the use of dried corn starch is still a universal practice, and will continue so as heretofore. Technical investigations of properties, advantages, and usage of the latter medium have justified what appears originally to have been an empirical selection dictated solely by economical expediency.

Conclusions

Particle size is revealed as being subservient to total surface area provided by a stabilising agent (see table). Surface exposure represents an index of optimum coverage of various starches, and a criterion of efficiency of these media in effecting partition of intimately associated ingredients of a baking powder. Granules per unit mass of wheat starch "fines" or rice starch provide least surface area, and consequently afford minimum exposure to humidity and adsorption. Potato starch, while composed of the largest granules, contains the least number of these in unit mass, thereby presenting less surface area to adsorption and humidity than either corn starch or coarse wheat starch. Granules of wheat starch "fines" (5 μ) are directly comparable with those of rice starch, thereby accounting for relatively limited surface area per unit mass. Corn starch presents surface exposure exceeding that of rice or potato starches, and wheat starch "fines", while the particle size of its granules is of magnitude affording efficient coverage of chemical reactants. The extensive surface area subject to exposure is compensated by a more efficient separation of active constituents of leavening mixtures than is provided by the other starches. It is of interest to note that the average size of corn starch granules approximates the mean value of all of the starches in the test series.

Rice starch and wheat starch "fines" may prove to be superior to corn starch and other equally efficient amylaceous media under rigorous exposures only by virtue of the relatively small areas subject to humidity and adsorption. Wheat starch "fines" and rice starch, while composed of granules of identical size (5 μ), are nevertheless characterised by differences in their respective particle enumerations (noted in table) for unit mass. These variations must be attributed to reasonable divergences in granule counts or to differences in their densities.

Type.	*No. of Starch Granules per Gm.* (1).	*Average Diameters of Starch Granules.*		*Surface Areas in Square Inches per Average Granule* (6).	*Total Surface Area in Square Inches Exposed by Granules per Gm. of Starch.*
		Microns.	*Inches* (5).		
Corn starch	{1,880,000,000 / 2,432,000,000}	25	0·0010	0·000000078540	{1476 / 1910} Av. 1693
Potato starch	147,500,000	70	0·0028	0·000006157000	908
Rice starch	2,075,000,000 (2)	5	0·0002	0·000000003142	65
Wheat starch, C*	1,214,000,000 (3)	35	0·0014	0·000001540000	1869
Wheat starch, F*	3,200,000,000 (4)	5	0·0002	0·000000003142	65

* Symbols C and F denote "coarse" and "fines" respectively.

(1) According to Berger ; Schneider, A., *Micro-Analysis of Powdered Vegetable Drugs*, Phil., 1925.

(2) Berger (*loc. cit.*) quotes 1,660,000,000 granules per gm. of rice flour containing 79 per cent. of starch. Assuming the enumeration to have been conducted with a rice flour of 80 per cent. to facilitate calculations, the total granules on the basis of 100 per cent. will therefore be

$$80 : 1{,}660{,}000{,}000 :: 100 : x, \text{ where } x = \frac{1{,}660{,}000{,}000 \times 100}{80} = 2{,}075{,}000{,}000 \text{ granules.}$$

(3) Interpolated as above ; theoretical 100 per cent. starch-granule content based on Berger's data for counts conducted with wheat flours containing 75 per cent. of starch.

(4) Interpolated as (3) ; granules of this size (5μ) are invariably the most abundant.

(5) Based on data of Gallay and Bell, *loc. cit.*

(6) Calculated by formula $(0{\cdot}7854\ d^2\mu) \times 0{\cdot}00003937 = 0{\cdot}31\ d^2\mu$ as the modulus for converting surface area expressed in square microns to square inches, where $d^2\mu$ = diameter in microns (1 micron = 1μ = 1/25,400 inch.) Computations based on assumption that the granules are uniformly circular in form.

Wheat starch of large grains is comparable to potato starch in its inferiority to corn starch in a similar capacity under same environment.

Dried corn starch has at all times met requirements as a stabilising agent, and from present indications will continue so to be employed in the future. Innovational media serving the usual purpose of starch in baking powders are proposed from time to time in patent and current technical literature, but are invariably relegated to premature obsolescence through lack of commercial recognition. Most materials thus far proposed as substituents for dried corn starch in leavening mixtures, while in some cases superior in efficiency to this material, are as a rule considerably more expensive.

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[14] *Cake Making*, London (1930).
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[16] *Analysis of Foods*, Phil. (1925).
[17] Theoretical formula, $MgCO_3$; light and heavy grades of this compound are available with the following probable composition:
Light: $MgCO_3$ or $MgCO_3.3H_2O$.
Heavy: $4MgCO_3.Mg(OH)_2.5H_2O$, or $3MgCO_3.Mg(OH)_2.3H_2O$.
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[30] U.S. Patent No. 2,000,160 (1935).
[31] U.S. Patent No. 1,210,940 (1917).
[32] U.S. Patent No. 1,264,592 (1918); U.S. Patent No. 1,286,903 (1918); U.S. Patent No. 1,558,888 (1925).
[33] U.S. Patent No. 1,170,474 (1916).
[34] U.S. Patent No. 1,322,561 (1919).
[35] U.S. Patent No. 1,230,452 (1917).
[36] U.S. Patent No. 1,427,979 (1922).
[37] U.S. Patent No. 1,847,799 (1932); British Patent No. 303,353 (1927).
[38] U.S. Patent No. 1,988,464 (1935).

Valuable Service for Food Executives

STARTED in March, 1936, in an attempt to reduce the difficulties of locating the literature of specific subjects, the Central Agricultural and Scientific Bibliography (C.A.S.B.) found a home in that huge collection of the world's scientific literature, the Science Library, South Kensington.

The inadequate indexing hitherto practised made it extremely difficult to locate references in the literature. The C.A.S.B. has a large technically qualified staff widely experienced and familiar with all sources of information, linguistically expert and covering between them most of the European languages. If the indexes of the organisation do not hold the required references a search is carried out, and in record time the complete bibliography of the subject is sent to the subscriber. If necessary the papers themselves are sent.

This scheme has been supported by such bodies as the Nederlandsch Instituut voor Documentatie, and it forms a remarkable source of knowledge. No longer will duplicate researches into the literature be wastefully carried out; the C.A.S.B., by collaborating with other abstracting institutes, records details of practically every search made.

Briefly, the subscriber to this scheme has at his service a complete bibliography of all the literature he may possibly require in his work. The scheme is a private enterprise and is non-profit-making.

Society of Chemical Industry

THE part played by chemists in the effort by nations to secure self-sufficiency was commented on by Dr. L. H. Lampitt, Vice-Chairman of the Food Group of the Society of Chemical Industry, on September 17 at the Autumn Meeting of the Society held at the Empire Exhibition. Dr. Lampitt's address was one of the series on "The Trend of Progress—Where are we Heading?" Dr. Lampitt commented on Germany's autarchy and asked, "Are we to believe that Germany is alone in this respect?"

Pressure on space compels us to hold over the complete report of Dr. Lampitt's address, which will appear in the November issue of FOOD MANUFACTURE.

MIXING IN THE FOOD INDUSTRY

Almost as varied as the very materials they mix is the present range of mixing machines. This survey, covering comprehensively the four important types of mixers, with in turn their variants, will help when the question of acquiring mixing plant arises.

William C. Peck, M.Sc., M.I.Chem.E., A.I.C.

THE DESIGN of mixers has been largely based on empiricism, with the result that the number of different patterns in use is very large.

The very large number of types of mixers at present in use to-day is quite unnecessary, and this is the principal reason for the difficulty of co-ordinating knowledge of the subject. Proper mixing equipment is always money-saving equipment.

Mixing has the least scientific basis of all the processes carried out in the food industry. For instance, there are no rules by which one can determine the speed of mixing or degree of mixing under given conditions.

The Object of Mixing

The object of mixing is best defined by stating that two or more materials are to be put in a condition where each particle of one material is as nearly adjacent to a particle of each of the other materials as is possible. In practice perfect mixing is never attained, nor in many cases is it necessary or desirable, for the degree of mixing required in finished products varies.

Principles of Mixing

A mixing unit consists essentially of a mixing element fitted into a container, and the design of the mixing element must be made in relation to the shape and size of the container. In any efficient mixer in operation there is a local zone of intense mixing, with an outer zone where the materials are being caused to flow towards the local zone. Because the most vigorous motion is produced in the vicinity of the mixing element, the greatest intimacy is produced there.

The requirements of a mixer are, firstly, that the degree of final mixing must be sufficient for the desired product and, secondly, that the whole amount of the material in the container must be given a direction and rate of movement so that it be brought to the local zone of intense mixing of the mixing element.

The power absorbed by a mixing unit is used, first, to produce the local intense and intimate mixing round the mixing element and, next, to give a direction of flow to the whole of the contents of the container so that they are brought to the local zone. The power taken by the first action is much greater than that taken by the second.

In the local zone the degree of mixing depends on the differential rate of flow of the various components to be mixed. The differing rates of flow are brought about in two ways, or by a combination of both of these ways: by direct contact between the parts of the mixing unit—*i.e.*, the element and the container—and the materials to be mixed; by movement or flow imparted to the materials by the mixing element.

Shear is the most important factor in the conversion of the forces generated by the mixing element into the production of differential flow rates of the materials.

The mixing element has to transmit forces so that a rate of flow is imparted to the whole of the contents of the container for every portion to be uniformly and repeatedly brought to the local zone and so subjected to the intense mixing action that takes place there. Mere movement of the whole contents of the container is not sufficient. Stratification of the contents or settling of one of the components will render the performance of an otherwise good mixing element quite worthless. Both of these phenomena are due to failure of the mixing element to impart the necessary direction and rate of flow to the contents.

The shape of the container may be the principal cause of the failure of the element to produce both requirements for efficient mixing. Both vertical and horizontal flow must be imparted to the materials and both must be sufficient for all the material in the container to be brought ultimately to the local intense mixing zone.

However intimate and intense is the mixing in this zone, the resulting dispersion, solution or reaction is ineffective unless the general rate of flow of the whole of the material is sufficient to bring material from the remote parts of the container to that zone.

The principal cause of failure of many mixer designs is when the mixing element does not produce the required general rate of flow. Many mixing plants are inefficient with regard to time required for mixing and for horsepower consumed because of this failure.

FIG. 1.—"The simplest form of paddle-type mixer, the straight-arm mixer . . ."

[*Courtesy, Apex Construction, Ltd.*

Selection of Mixing Equipment

Mixing plant should not be considered solely from the point of view of providing a mixing unit. The question of conveying the material to the mixer and its subsequent removal from the mixer, either to the next plant unit carrying out a subsequent process or to filling machinery, should always be borne in mind.

Efficient mixing equipment design is based on the consideration of the following four points:

1. The conveyance of the material to the mixer.
2. The local intense mixing action of the mixing elements.
3. The general flow of materials in the container.
4. The conveyance of the materials from the mixer.

When the materials are liquids, the first and last points are simply solved, but with pastes and solids these points have to receive special consideration.

Mixing equipment for the food industry should be designed so that cleaning of the mixing element and the container is easy. The design also should be suitable for construction in special metals, such as stainless steel, nickel and "Monel metal".

Clean, sanitary conditions must be achieved both inside the equipment and outside, so rounded-out designs are adopted to reflect graceful streamlining and to eliminate all dirt-collecting areas.

Mixer Types used in Food Industry

The types of mixers used in the food industry can be grouped as follows:

1. Paddle mixers.
2. Propeller or helical mixers.
3. Turbine or centrifugal mixers.
4. Miscellaneous types.

1. Paddle Mixers.—The most widely used and oldest form of mixing equipment. The material is moved in circular paths, and that immediately in front of the blades is moved faster than that between the blades. As a result the position of layers of material is repeatedly changed, effecting constant redistribution of the material. Eddying always occurs behind the blades in motion, so local mixing takes place there.

Paddle mixers cannot produce flow at right angles to the plane of movement of the arms, so that the layers of material are not cut across by any flow of material. The blades are inclined in an attempt to obtain the movement lacking, and this helps somewhat. The type is good for thin and medium viscosity liquids and will handle suspensions of solids of small particle size and low specific gravity. It is widely used for heavy slurries. Mixing is slow, and for continuous use, as opposed to batch mixing, the type should not be considered.

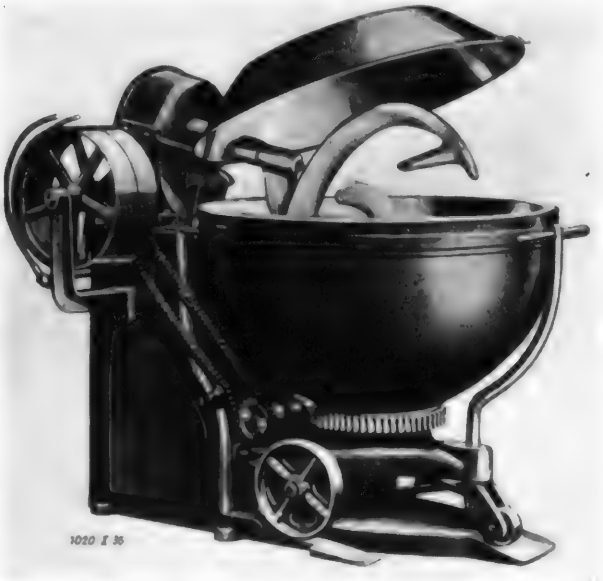


FIG. 2.—Rotating pan mixer, ". . . principally used for pastes and viscous substances."

The first cost is low and the horse-power requirements, where the type is suitable, are moderate.

Stratification occurs with heavy solids in liquid of light density, and with viscous liquids the mixing is inefficient, and in such cases greatly increased horse-power does not result in good mixing.

1 (a). Straight-Arm Mixers.—The simplest form of paddle-type mixer, the straight-arm mixer, is shown in Fig. 1. They can be built on a horizontal or vertical axis, and the gate-type mixer is only a simple modification. The introduction of stationary baffles assists to break up the layers of material. Paddles and stationary baffles are often inclined and then aim at directing currents at right angles to the plane of rotation of the paddle arms. This mixer is used for heavier liquids, pastes and doughs. With materials such as pastes and doughs that do not flow easily the stationary blades assist

the stretching, shearing and folding actions by which mixing is accomplished.

1 (b). Double-Acting Mixers.—This mixer has two sets of blades which rotate in opposite directions and is principally used for pastes. Scraper blades are sometimes attached to the blades so that the walls of the container are actually scraped continuously. Such devices are introduced where the material has to be heated or cooled, as then the heat transfer is greatly accelerated. The confectionery industry's "caramel pans" are examples of this type.

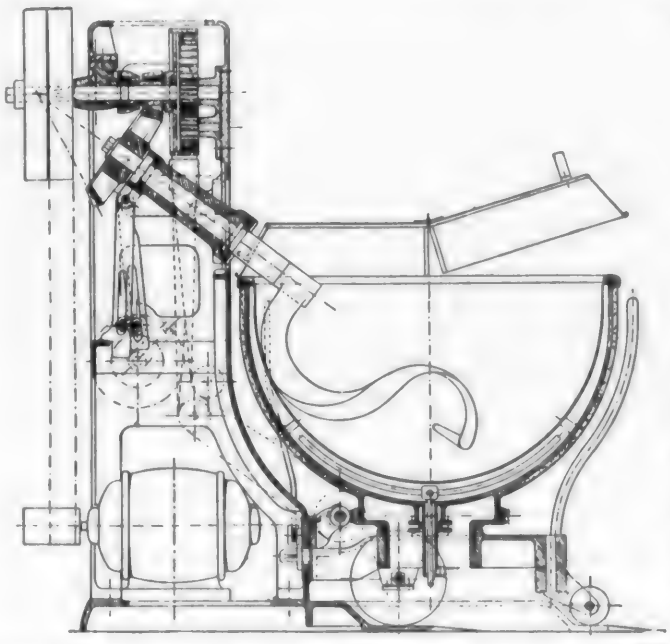


FIG. 3.—"The design of a rotating pan mixer jacketed for steam heating."

1 (c). Horseshoe-Type Mixers.—Horseshoe- or anchor-type mixers are usually those where heat transfer is an important consideration. The container is hemispherical or similarly shaped, and the design's prominent feature is that the mixing element fits closely to the container wall. As a result these walls are kept clean and good heat transfer is obtained. This type is used for some cake doughs and similar materials.

1 (d). Rotating Pans with Offset Blades.—This mixer, illustrated in Fig. 2, is principally used for pastes and viscous substances. The container, usually bowl-shaped, revolves on a turn-table, and the blades or mixing arms can be stationary or can revolve also. By the revolving of the bowl the whole of the contents are brought in turn under the local mixing action of the blades. The bowls are often mounted on castors so that they then act as conveying containers for the pastes. The unloading of pastes is always difficult, and so as to minimize the handling of these substances a series of bowls are employed, which in turn are brought to the mixing machine and then form the containers. The bowls can be jacketed for heating or cooling, being then fitted with flexible connections. Fig. 3 shows the design of a rotating pan mixer jacketed for steam heating. The bowls can be of cast iron or mild steel, tinned or enamelled, but construction with special metals such as stainless steel, nickel, nickel-clad steel and "Everdur" is being adopted.

The introduction of a vacuum-tight cover is a newer development which assists the displacement of air in the dry materials by the liquids introduced. An estimate of the horse-power consumed by this type of mixer when handling materials used in the food industry can be gauged from the following formulæ:

$$H = 0{\cdot}8x + 0{\cdot}3 \quad \text{and}$$
$$H = 0{\cdot}044G + 0{\cdot}3,$$

where H is the horse-power required,
x is the weight of flour (and/or other solids) in 100 lb.,
G is the capacity of the bowl in gallons.

1 (e). Double-Motion or Planet Mixers.—These mixers have paddles mounted off centre in a container, with the shaft of the paddles revolving around the centre of the container (Fig. 4). An intensified local mixing zone is thus brought to every part of the container, so that, while local mixing is brought about, the progress of the mixing element in cycloidal paths produces intermixing. This type is widely used in the food industry for doughs, pastes, cake batters, chocolate and cream fillings. They are usually equipped with two- or three-speed gears, but there has been considerable development in

[Courtesy, Lancashire Dynamo and Crypto, Ltd.

FIG. 4.—Double-motion mixer, "These mixers have paddles mounted off centre in a container with the shaft of the paddles revolving around the centre of the container."

the method of obtaining variable speeds. It is now possible to obtain this type of machine with a variable speed drive in which no gears are used. This makes the mixer not only a very much more useful piece of plant, but, in addition to being a cheaper construction, eliminates the possibility of contamination by oil from the gears.

Double-motion mixers are often fitted with whisks instead of paddles (Fig. 5). The whisks are of the egg-beater type, and are run at high speed. Mixing is brought about by impact, and a fine state of division is the result of beating. They are used for the production of mayonnaise, where two immiscible liquids are used,

[Courtesy, Apex Construction, Ltd.

FIG. 5.—New type, variable speed, double-motion-mixers, ". . . are often fitted with whisks instead of paddles.".

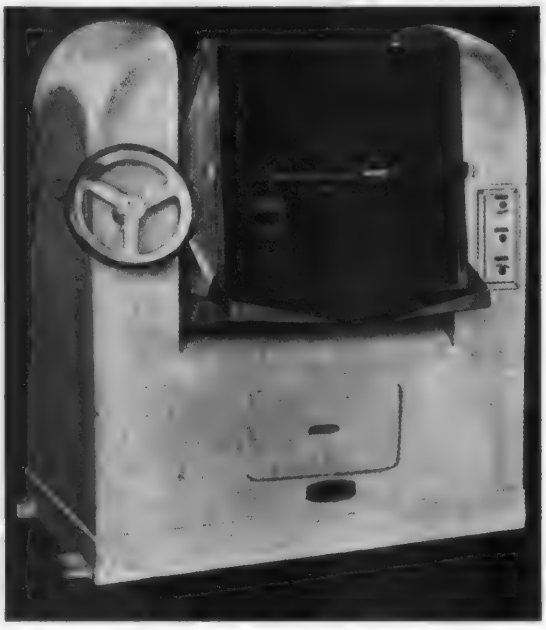


FIG. 6.—". . . the straight-slat type mixers for pound-cake batches."

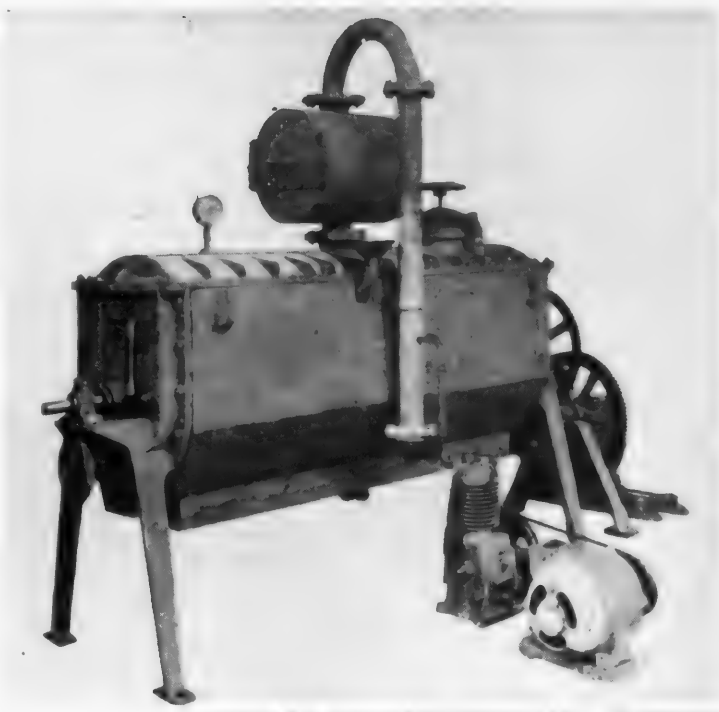
and for the production of whipped cream, where a gas, *i.e.*, air, is beaten into a liquid.

1 (f). Kneader Mixers.—This mixer has one bent arm, or two bent arms rotating in opposite directions, always on a horizontal axis. In certain designs the arms rotate at differing speeds in a divided trough. They are used for the most difficult of viscous pastes. The design of the blades is important. The speed, direction of rotation, tangential or overlapping blades, angle of helix and cross-sectional shape are all contributory factors in the correct design. Thus, arms with teeth are used to give more shearing, tearing and shredding as well as kneading action.

The Mixing and Kneading of Pastes and Doughs

The mixing of pastes and doughy masses, usually sticky and thick, is the most difficult of all mixing problems, as the flow of the material is extremely limited. Usually the yield point of the material is high, and substantial force has to be applied before any movement or "shear" is produced. Since little or no flow takes place, one constituent has to be forced between the particles of the other constituents until the mixture is homogeneous, or until all the solid particles are wetted. This result is obtained by kneading, tearing, stretching and folding in the following manner.

In the production of dough, flour already fully aerated, with lesser ingredients and a small quantity of water, have to be so mixed that all the materials are homogeneously distributed in respect of each other. To do this the water has to displace all the entangled air and finally uniformly wet the flour particles. The mechanical action performed by any efficient dough mixer is represented by the following processes. To aid the displacement of the air by the water, the mixer must knead or compress the materials against the walls of the container. In so doing some shear is also produced. Portions of the material are torn off and so transferred to other parts of the container, there to be mixed and so redistribute the



[Courtesy, Wm. Gardner and Sons (Gloucester), Ltd.

FIG. 7.—". . . an electrically heated mixer built for vacuum operation."

materials. At certain stages of the revolution of the arms of the mixer stretching of the material takes place, and this action aids the incorporation of the water into the flour, because the tension produced results in compression, as in the kneading action, at right angles to the direction of stretch. The stretched material is then folded by the action of the arms, over and over, and so redistribution of the material is accomplished. To achieve batch homogeneity the mixing element has to carry material from one end of the container to the other, so the bent arms are usually not parallel to the axis of rotation, but are inclined in order to obtain lateral movement of the material.

In the biscuit and cracker industry modified arms are employed. For cake batch mixers there are usually two types of mixing arms—the straight-slat type for pound-cake batches (Fig. 6) and a spider type for sponge-cake batches. Jacketed containers are very often used, but, however, vacuum operation, a newer development in general mixing problems, has not the same application in the food industry. Figure 7 shows an electrically heated mixer built for vacuum operation.

2. Propeller and Helical Mixers.—These simple and inexpensive mixing elements are excellent for thin and medium liquids. The mixing action is produced by helical blades which revolve at high speed and constantly force forward a continuous cylinder of material. Slip, however, takes place and currents set up, so that the cylindrical form of the driven material is modified. As the material is driven in a straight line, the shape of the container is important, for this determines the direction and velocity of the secondary flow—*i.e.*, the flow of the material back to the propeller. The influence of the shape of the container is often overlooked, and it is not usually realised that the mixer proper consists of the mixing element and the container in which the mixing element is mounted.

Propeller mixers are unsuitable for large batches of heavy liquids and will not give intimate mixing with viscous substances. They will, however, handle liquids with light solids, but with heavy solids, especially in flat-bottom tanks, prevention of settling at the tank bottom periphery is difficult. The position of the propeller itself in the container is an important influence on the efficiency. Off-centre location is adopted to prevent swirling of the material. This class of mixer is popular because the first cost is low and the power requirements moderate. The mixers can easily be made portable by providing a clamping device for fixing the propeller

[Courtesy, Aluminium Plant and Vessel Co., Ltd.

FIG. 8.—Side entry propeller stirrer, ". . . for large tanks and light liquids, the propeller is best introduced in the side of the tank."

shaft to the side of the vessel. Propeller mixers fall into several groups.

2 (a). Push-Pull Propeller Mixers. — The push-pull type has two propellers mounted on one shaft, the top propeller giving a downward stream, and the lower an upward stream. Both streams meet about half-way up the container and are then deflected outwards in a horizontal direction. This change in direction of flow is good,

[Courtesy, British Rema Manufacturing Co., Ltd.

FIG. 9.—Powder mixer, ". . . used for dry or nearly dry solids . . . flour, self-raising flour mixtures and baking powder."

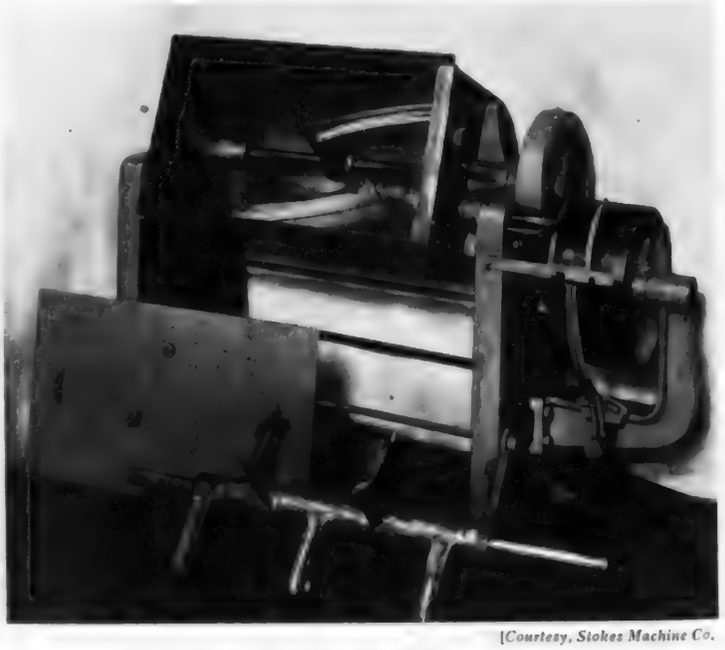
as every efficient mixer has adequately to provide flow in two directions at right angles.

2 (b). Side-Entry Propellers.—For large quantities of liquids the use of a propeller on a shaft revolving at high speed is limited by the length of the shaft. Therefore for large tanks and light liquids the propeller is best introduced in the side of the tank (Fig. 8). For the mixing of liquids of widely different viscosities the propeller type is unsuitable, as with them a high-velocity vertical stream is difficult to produce. The introduction of a draught tube in order to produce a definite direction of flow and to overcome the side slip of the material acted on by the propeller is an improvement. Propellers fitted with draught tubes are the most efficient of their class, and with them moderately viscous liquids can be mixed.

2 (c). Ribbon or Double-Helical Mixers.—These are special forms of mixers used for dry or nearly dry solids (Fig. 9). They mix flour, self-raising flour mixtures, and baking powder. The design of mixers for solids is mainly concerned with achieving vertical mixing. With solids of the same particle size, but differing specific gravity, the heavier solids tend to collect at the bottom. However, with solids of the same specific gravity, but differing particle size, the larger and therefore heavier particles tend to collect at the top, together with polyhedral or irregularly shaped solids. Thus in the design of mixers for solids these two natural tendencies to separate must be borne in mind and special means adopted to get vertical mixing.

The mixing element consists of two helical ribbons or interrupted spirals, one right handed and one left handed. In operation the material moves backwards and forwards along a **U**-shaped container as well as in a vertical direction. The ribbon blades are narrow because mixing of solids requires constant slip of the blades to cause local eddies, to prevent the material from packing tight, and to keep the horse-power demanded as low as possible. This type of mixer is also used for thin pastes and slurries. The design of this group of mixers is probably the most inefficient of the whole of the various groups. There is evidence from recent official trials carried out that the rotating pan design of mixer, when adapted for dry or slightly dampened materials, is more efficient both from the homogeneity of product and from the power consumed. Where dry powders have to be moistened, as in the initial stages of the production of malted milk tablets or concentrated food tablets, it has been usual in the past to use a paddle mixer of the type shown in the foreground of Fig. 10. It has now been shown that the broken spiral type of mixing element, shown fitted in the container in the same illustration, not only completes the operation in less time, but also requires less horse-power. In the incorporation of the granulating fluids for the production of

(*Continued on page* 354.)



[Courtesy, Stokes Machine Co.

FIG. 10.—Paddle mixer. "Where dry powders have to be moistened, as in the initial stages of the production of . . . concentrated food tablets, it has been usual . . . to use a paddle mixer . . ."

Should this or that machine be renovated or replaced, or should a new system be introduced? These are the periodical problems of food executives. The subject of food plant and machinery is too vast to cover in a single issue much less in a single review! In co-operation with the makers of machinery, we present this concise, sectionalised summary of a selection of the industry's equipment.

PLANT AND MACHINERY

BAKERY

DESIGNED FOR use in modern bakeries, Cook's circulating steam tube hotplates as shown on the right are heated by steam tubes bolted to the under side of a patent baking-top. The Hunter Machines Co., Ltd., who supply these hotplates, claim that, when using coke, Cook's hotplates can be kept working at one-tenth of the cost of direct gas-fired plates and, when fully employed, will save their initial cost within two years. A hotplate 12 ft. long by 2½ ft. wide, which gives a baking area of 30 sq. ft., can be kept working for a full day on 1 cwt. of coke.

Baking oat cakes on Cook's circulating steam tube hotplates.

CAN-MAKING

A LARGE installation has recently been completed by the Cameron Can Machinery Co. Illustrated below are the body-makers of the job, the first process in the canning line. This important machine makes the can body complete. The body comes to it flanged at both ends. Then this is notched and edged. The body next is formed and seamed. The side seam is soldered and the surplus solder wiped off. The completed body is then cooled by an air blast. During this job the engineers were unhampered by building limitations.

The output of the plant is in excess of a million and a half cans per day.

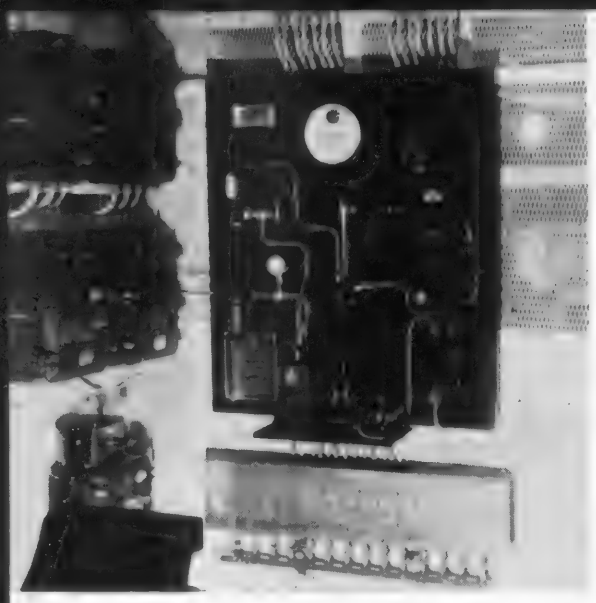
Bodymakers of a large can-making installation by Cameron Can Machinery Co.

CONTROL

A TEMPERATURE recorder made by Bristol's Instrument Co., Ltd., records, among other things, the temperature and relative humidity in a food compartment. An instrument called the "Time-of-Operation and Temperature Recorder" makes a complete 24-hour record of "on" and "off" periods of operation, and the refrigerator box temperature is made available on one chart.

A "Time Schedule Temperature Controller" which automatically controls temperature according to a predetermined time and temperature schedule is an interesting instrument from Short and Mason, Ltd. Temperature or pressure, or both, can be increased at a predetermined gradual or rapid rate, held constant for a fixed period, and decreased rapidly, gradually or in steps, completing the whole cycle at the scheduled moment. The operator simply pushes over a switch, and the instrument then controls the whole process. Any number of variations in temperature, pressure, etc., can be made by cutting new cams, accomplished in a few minutes.

The installation on many fruit farms and stores for home-grown fruits of electrical CO_2 equipment and distance thermometers has led to remarkable prevention of waste and the prolonging of the normal life of fruit over long periods.



CO_2 indicating outfit on food ship by Elliot Bros. (London), Ltd.

Hand-lift truck in dairy by Yale and Towne Manufacturing Co.

(*Continued from previous page.*)

This equipment is also being used on board ship, and our picture shows a view of the engine-room of one of the Blue Star Line's food-carrying ships with a complete CO_2 indicating outfit used for measuring the percentage CO_2 in each gas chamber storing chilled meat or fruit. The equipment is of a large range of similar control instruments supplied by Elliot Bros. (London), Ltd.

CONVEYING

THIS IMPORTANT procedure of food manufacture is well supplied with adequate machinery. The Yale and Towne Manufacturing Co. supply hand lift trucks and skid platforms, etc., which are used extensively for handling milk, syrup, and other food products. The illustration shows a "Blue Streak" hand lift truck specially adapted for dairy use, working in the Dumbarton Dairy Department of the Scottish C.W.S., Ltd.

For better conveyance on wharves and docks the electric trucks of Ransomes, Sims and Jeffries, Ltd., have been successful. It is claimed that in many cases it has been possible to save their cost in six months from the economies they make in reducing handling costs. The picture shows one of five electric trucks supplied to the Great Western Railway for use at their Swansea Docks.

In association with the Jervis B. Webb Conveyor Co. of Detroit, Fraser and Chalmers Engineering Works have produced the "Webb" conveyor system, which now has a very wide application in this country. The system can be employed efficiently for transportation, storage, processing, and assembly work, or for a combination of these functions. The system is very adaptable. Our illustration shows the conveyors handling bananas at the warehouse of S. Jackson and Co., of Birmingham.

DRYING

THE HEATING and cooling plates manufactured by Henry Balfour and Co., Ltd., can be used with considerable advantage in place of the method involving the use of stay bolts. The supports are left out. The bottom is dimpled by means of swagings; the end of the swagings, which butt against the top plate, allow the two plates to be electrically welded together.

This method of supporting the plates allows the least wall thickness to be used, according to the pressure in the steam space.

The fundamental advantages claimed for the rotary louvre dryer made by Dunford and Elliott (Sheffield), Ltd., are as follows: (*a*) The intimate contact between air and material ensures absolute uniformity and thoroughness of drying. (*b*) As the bed is shallower near the feed end, most of the hot air passes through the bed at this end, where the material is wettest, resulting in a very rapid initial drying. (*c*) Further along the drum, as the material becomes drier, less and less hot air is supplied, preventing overheating. This reduces the risk of damage or firing of the material, and saves the loss of sensible heat that occurs if the material is discharged hotter than necessary. (*d*) Fresh hot air is still supplied right up to the discharge end of the drum, maintaining a high difference in vapour pressure, so that drying to the minimum moisture content is obtained. (*e*) A constant supply of fresh quantities of drying air throughout the drying process is only possible by the Rotary Louvre principle, and it achieves the advantage of both counter-current and parallel-current flow without the disadvantages of either. It gives a high efficiency and a rapid initial rate of drying which are the normal advantages of parallel-current flow without the disadvantages of bulky plants and incomplete drying; and gives the high efficiency and the thorough, uniform drying of counter-current flow without the danger of overheating.

The continuous band or tilting tray type band dryer of L. A. Mitchell, Ltd., is composed of tiers of endless bands, and it is possible to utilise both sides of the bands, thus necessitating a much smaller

Above is shown an electric truck for dock transport by Ransomes, Sims and Jeffries, Ltd.

Below is shown the "Webb" conveyor system in a banana warehouse by Fraser and Chalmers, Ltd.

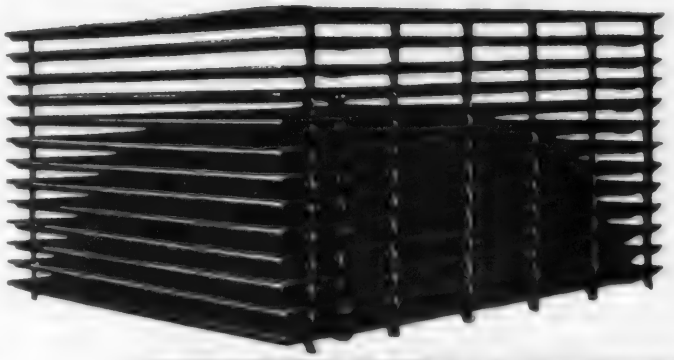
and more economic construction for a given purpose when compared with the usual endless band type of dryer. The bands themselves are composed of small sections, which, at the end of their travel in any one direction, are caused to tilt, thereby dropping the supported charge on to the returning under side of the band. Obviously, as both sides of the band are used, there is no accumulation of material on the under side—a common fault with the usual types.

This type of dryer is very suitable for drying a large range of food products, particularly almonds, raisins, shredded coconut, peel biscuits, etc. The rate of flow of product through the dryer can be varied over a wide range so that a number of materials of differing moisture content and heat sensitivity can be processed consecutively.

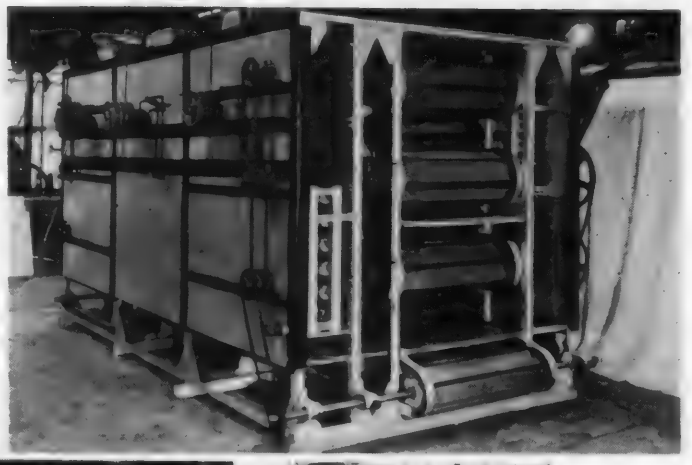
A small dryer, constructed in stainless steel, with a simple scraper agitator of the same material, complete with charging hole and quick-acting discharge door and chute, is made by John Thompson (Dudley), Ltd. This particular dryer is underdriven by means of a motor acting through a worm gear with vertical upward spindle passing through a stainless steel stuffing box on under side. It is suitable for all kinds of foodstuff drying and pharmaceuticals.

The "Scott" continuous vacuum band dryer is manufactured in all sizes by Geo. Scott and Son (London), Ltd. By means of varied patent devices many products which have not hitherto been dried in any continuous plant may be dealt with. The conditions during drying may be varied in the most elastic manner. Temperatures in heating elements can be variable, each series element being separately controlled. Heating is by means of hot water, low- and high-pressure steam, oil, etc. Perfect control of rate of feed and degree of dryness is possible, and feed and discharge are always under observation. Supervision and labour charges are negligible, and total operating costs reduced to a very low figure. The cooling zone provided is advantageous.

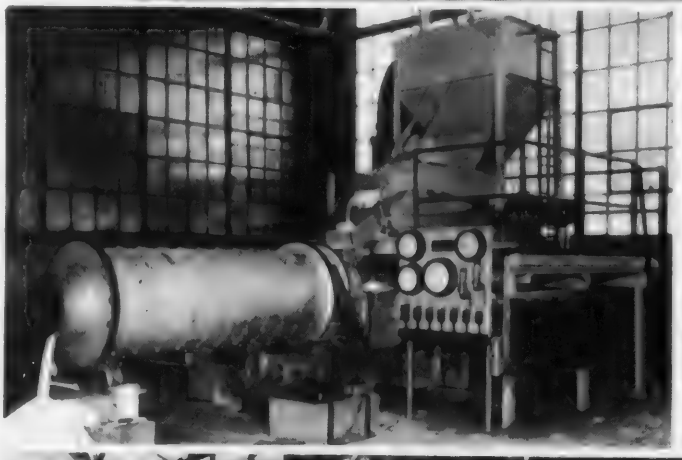
Small stainless steel dryer by John Thompson (Dudley), Ltd. (Below)



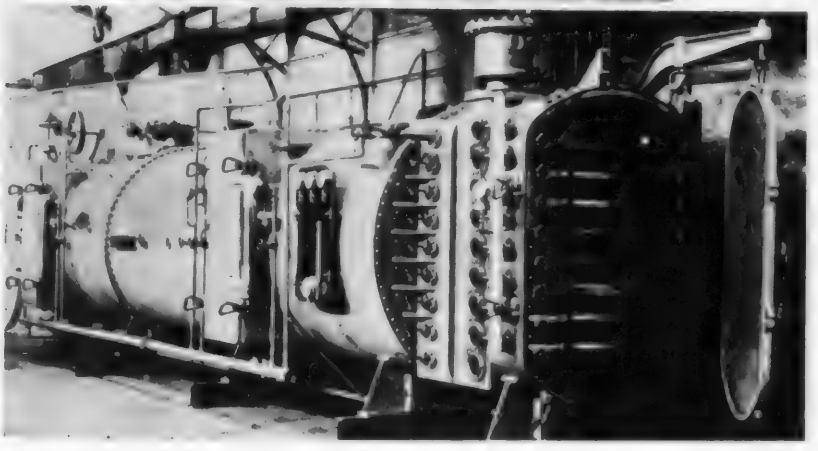
Heating and cooling plates by Henry Balfour and Co., Ltd.



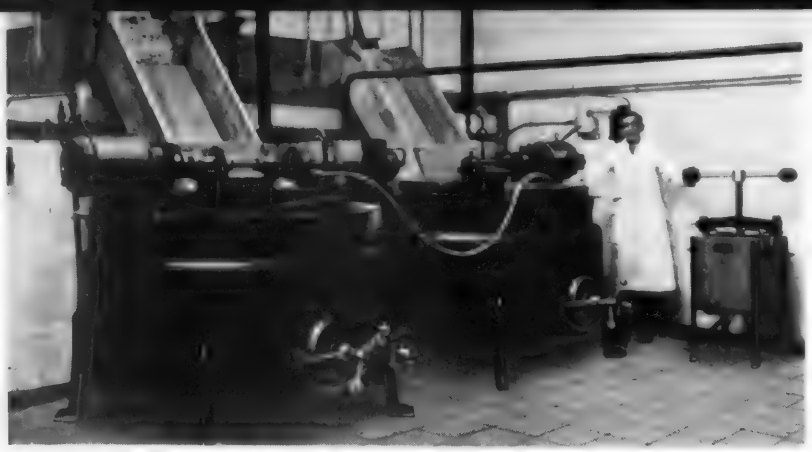
Continuous band or tilting tray type, band dryer by L. A. Mitchell, Ltd.



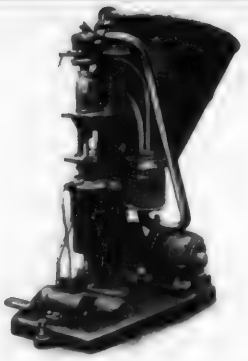
Rotary louvre dryer by Dunford & Elliott (Sheffield), Ltd.



Continuous vacuum band dryer by Geo. Scott (London), Ltd.



Settling pan for rendered fats, by Wm. Douglas and Sons, Ltd.



Vacuum filler by Ashworth and Parker, Ltd.

10-head filler by Albro Fillers and Engineering Co., Ltd.

Below that is shown the automatic filler of J. G. Jackson and Crockatt, Ltd.

FAT TREATMENT

THE TREATMENT of fats is the special process for which Wm. Douglas and Sons, Ltd., make a number of machines. We illustrate a settling pan for rendered fats. This type of pan is built with base jacket only, or with half body and base jacket. It is fitted with removable top strainer, and any fine sediment passing the strainer quickly settles on the bottom of the pan. From here the clear rendered oil may be safely drawn off at a front outlet into a shallow vessel, whence it is usually pumped into a cooling and filling pan.

FILLING

THE ALBRO 10-head vacuum-operated machine for filling sauces, coffee essence, oils, etc., into various sizes and shapes of bottles is made by Albro Fillers and Engineering Co., Ltd. This machine ensures a uniform level in every bottle without waste, spilling, or drip. There are automatic cut-outs on feed and discharge wheels. The filler takes various sizes of bottles, which are handled automatically.

The latest design of automatic filling machine, made by Robert Kellie and Son, Ltd., of the five-pocket, rotary telescope type, fills the cans with a predetermined quantity of peas or beans, and is readily adjusted by a hand screw. From the rotary hopper the peas drop into revolving pockets as they pass under the hopper, then through funnels into the cans, prior to brining, so that a measured amount of peas will be found in each can, irrespective of the amount of brine introduced. The briner is an inclined plate revolving inside the brine or sauce tank, the lower edge of the plate revolves inside the liquid line, and the quantity of liquid is regulated by hand wheel moving the displacement plungers up and down in the measure tubes. The "no-can-no-fill" attachment will not allow peas or beans to drop should can fail to be put in can runway, and does not stop the filler. This machine fills small tins of peas as perfectly as large sizes, and is operated by clutch lever. A special lever is also provided whereby cans in the machine can be run out when changing grades of peas.

The vacuum filling machine of Ashworth and Parker, Ltd., is stated to have been evolved to successfully fill into bottles and jars mixtures of liquids and solids such as pickles and chutney, plastic mixtures such as mincemeat, and thick viscous liquids such as malt extract, molasses, mayonnaise, etc.

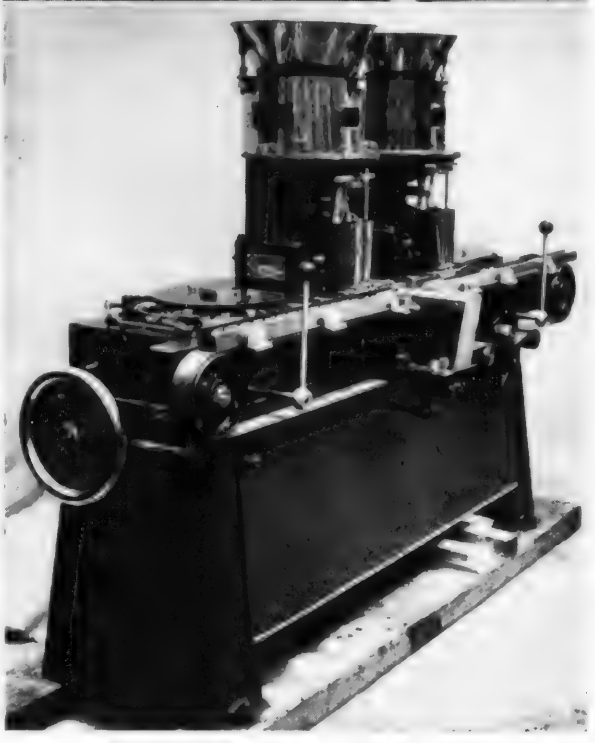
It consists primarily of a fabricated steel bedplate upon which stands a column conveniently forming a vacuum receiver. This column carries the table for the container, and at its upper end a nozzle of special construction, to which is coupled the suction tube conveying the material from either a hopper embodied with the machine or from containers which may be conveniently brought to the machine. Alternatively, the machine may be made portable and the filling take place at the side of permanent vats, tanks, etc., through a suitable suction tube.

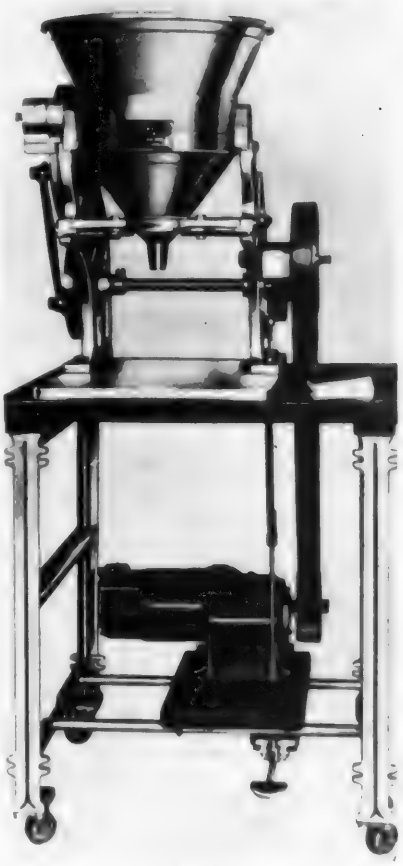
At the back of the machine is a motor-driven vacuum pump which provides the suction, thus making the unit self-contained.

The Automatic Weighing and Packing Machine Co. make a wide range of filling machines for a number of purposes.

As an example, the method of handling flour and sugar installations is as follows: One operator opens the bags or cartons, takes the accurately weighed quantity discharged from the machine, afterwards passing along for the subsequent operations of folding, sealing, and boxing. In the case of both plants it is possible to handle at least one ton per hour.

J. G. Jackson and Crockatt, Ltd., have a new fully automatic filling machine which fills a tin and settles its contents while still leaving an appearance of fulness when finished. The filling is done in two stages—two thirds of the contents are first put into the tin,



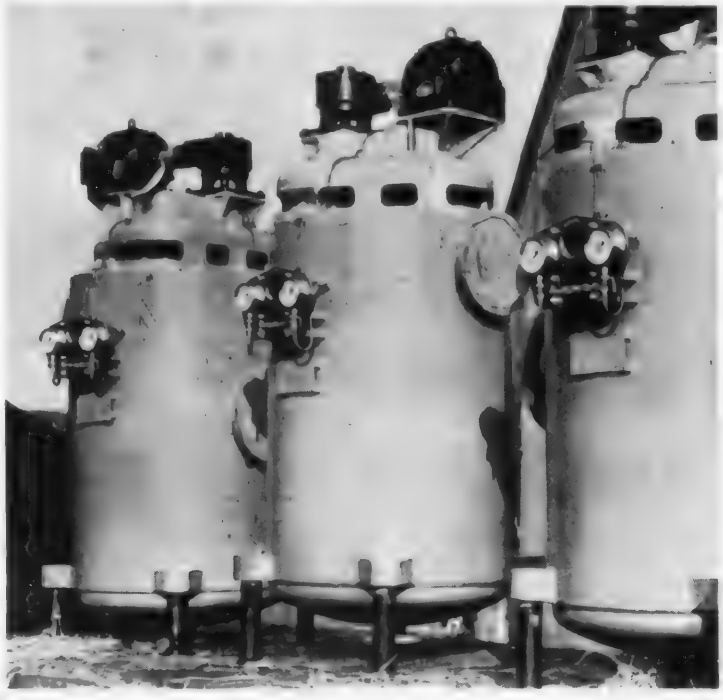


Above is a small filling machine by the Automatic Weighing and Packing Machine Co.

FILTRATION

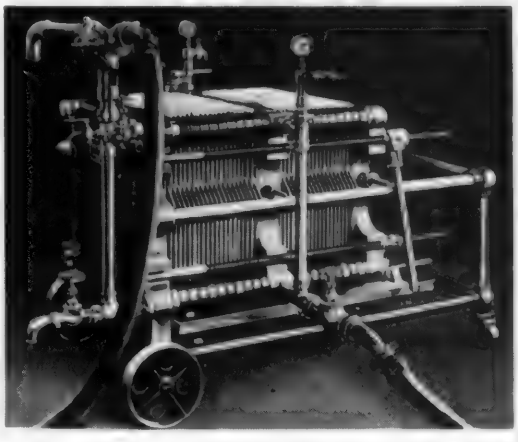
FOR THE removal of all solids and impurities from liquids Auto Klean Strainers, Ltd., make self-cleaning strainers which supersede the complicated twin-gauge baskets. Where the sludge content of any liquid is excessive it is quite a simple matter to arrange a small electric motor to give the strainer constant rotation for cleaning. In the illustration are shown 10-in. bore strainers which deal with 25,000 gallons of oil per hour. Auto Klean strainers have been used for refrigerator lubricating oil systems, air cleaning plant, coffee essence, bottle-washing machinery, etc.

For the sterile filtration of fruit juices, etc., John C. Carlson supply the "Seitz" filter. The method of operation is simple. After preliminary treatment the juice is stored in sterile casks by passing it through a sterilising filter, thereby freeing it from micro-organisms. After a maturation period of several weeks the juice is then bottled by the use of the filter.

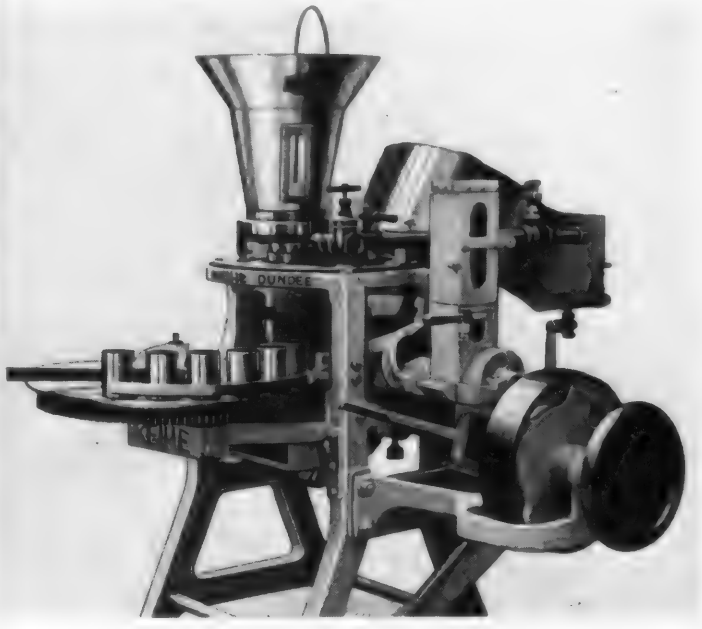


"Auto-klean" strainers.

Below, five-pocket rotary filler by Robt. Kellie and Son, Ltd.

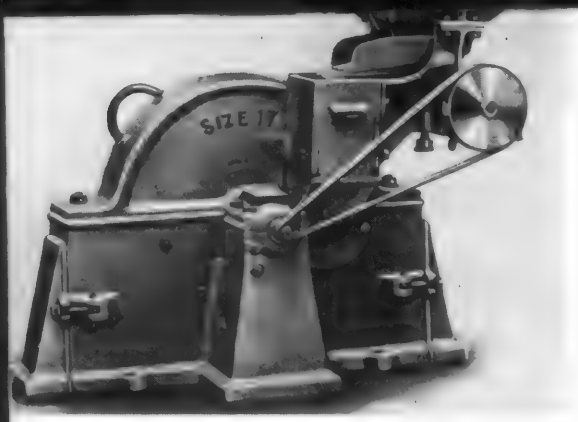


Seitz "Zenit" filter sold in this country by John C. Carlson.



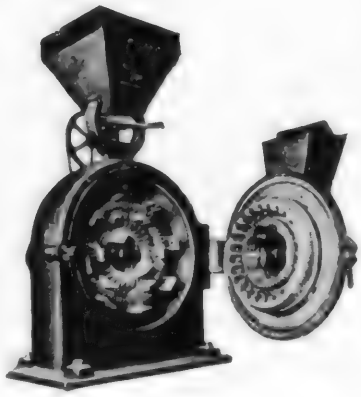
(*Continued from col. 2, opposite page.*)

which is then settled, and the remaining one-third added. The action is fully automatic. The machine receives the tins to be filled on a band conveyor and discharges the filled tins at the other end of the same conveyor. The rate of output (which is capable of being increased) is 70 tins per minute with one operator, and is entirely driven by one electric motor.



Disintegrator by Christy and Norris, Ltd.

"Pulmac" mill by International Pulverisers, Ltd. (Right)



GRINDING

A DISINTEGRATOR manufactured by Christy and Norris, Ltd., has been used for a wide variety of purposes for many years past. In grinding sugar they are used alone when fine sugar is required for confectionery purposes, but when numbers of different grades of icing, bridal, castor, etc., are required the machines are used in conjunction with sifters. They are also widely used in connection with spice grinding.

Another grinder of wide application is the patent "Dreadnought" grinder of W. S. Barron and Son, Ltd. This machine is claimed to grind such materials of varying nature as seeds, soya beans, salt, chalk, etc.

The "Kek" mill is extensively used in food works for grinding, blending, and emulsifying. Sugar, water, and milk powder may be reduced to condensed milk consistency in one operation. The manufacturers are the Buffoline Noiseless Gear Co., Ltd.

The Alexander Manufacturing Co., Ltd., offer meat-grinding machines of the pedestal type, with a standard motor fitted on adjustable rails inside the base and driven by multiple Renold's roller chains and machine-cut helical gears. The meat is forced by a conveyor worm through sets of stationary perforated plates and revolving knives, and is thus reduced by gradations to any required degree of fineness in one operation. This principle of grinding has been largely adapted for materials such as hide and leather waste, fruit and vegetable pulp, malt and hops, sugar-beet leaves and crowns.

The "Pulmac" mill manufactured by International Pulverisers, Ltd., is specially designed to deal with a wide range of material and can be adjusted to give any required fineness from a coarse granulation to an impalpable powder. The standard "Pulmac" mill is made in five sizes, and all sizes can be supplied with either flat or V-rope drive pulley. Another general purpose mill is the "Miracle" mill supplied by Miracle Mills, Ltd. To all intents and purposes the "Miracle" mill is a combination of three machines extensively used in the confectionery and allied trades, being a combined grinder, dresser, and conveyor. A very wide range of raw materials may be handled, including cereals, chemicals, all kinds of food products, gelatines, gums, malt extracts, oatmeal, spices, sugars, etc.

Wm. Fuller Junr.'s "End Runner" grinding and mixing mills are, in effect, mechanically operated pestles and mortars. The pestle (runner) is set eccentrically and is driven in friction from the mortars, thus giving two speeds, with consequent rapid reduction. The pestle is hinged in the smaller mills or raised by a lever in the larger ones to facilitate emptying and cleaning.

LABELLING

THE Lazenby and Ridgwell Canning Machinery Co., Ltd., labelling machine has an output of up to 9,000 an hour. The passage of the cans through the machine is fully automatic. The cans pass over an electrically warmed adhesive before picking up the label and passing out of the machine. The supply of labels is automatic. The machine is fitted with an ingenious device by which any of the few cans which pass through the machine without picking up a label are automatically thrown out and returned for redelivery to the machine. The machine is mounted on wheels and can easily be moved from place to place. The standard model is supplied with an electric motor, but special arrangements can be made for running the machine by transmission or by hand.

The Beth Label and Wrapper Machines, Ltd., have installed a battery of nine "Beth" labelling machines in the Sheffield factory of Batchelor's Peas, Ltd. These machines label at the rate of 100 cans per minute, and the latest advices received by the manufacturers are to the effect that they are giving every satisfaction.

A labeller commonly used in the food industry for handling bottles, jars, tins, cartons, soft packages, etc., is the "World" labeller, made by the Purdy Patent Machinery Co., Ltd. A single operator only is required, and outputs are from 20 to 48 per minute, depending, of course, upon the character of the work concerned.

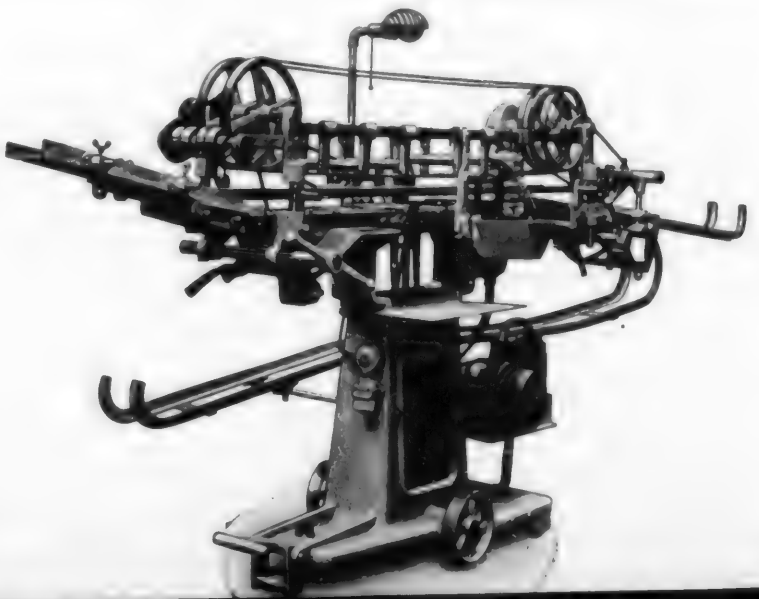
MIXING (See also article on Mixing)

AS FAR as the actual mixing process is concerned, the new "Overhung" model made by the Morton Machine Co. is identical with their "Morton" whisk. The "Overhung" model's (pictured at the bottom of the opposite page) particular advantages are, however, especially applicable to mixes which in their finished state are of fairly thin cream, such as mayonnaise, sauces, and salad creams. The particular design of the receptacle for the contents makes it possible for it to be placed underneath the machine ready for the contents to run directly in without the removal of the beater. In the older models emptying was by means of removing the lid and tipping the machine.

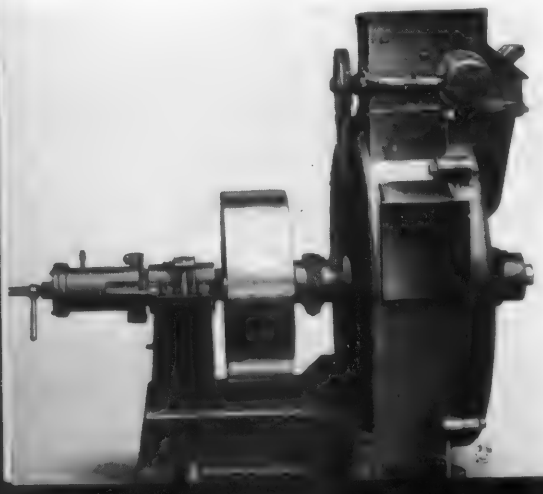
It is, however, to be understood that the machine is not superseding the older type, but is advantageous for products such as those mentioned.

William Brierley, Collier and Hartley, Ltd., produce an under-drive mixer with an automatically tilted pan for emptying purposes. Because of this the pan is heavier than in the ordinary vertical type mixers. It is a great advantage that the additional weight does not add to the

Labelling machine with output of 9,000 an hour by the Lazenby and Ridgwell Canning Machinery Co., Ltd.



The patent "Dreadnought" grinder of W. S. Barron, Ltd.



"Beth" labelling machines working in the Sheffield factory of Batchelor's Peas, Ltd.

sugar boiler's difficulties. When the batch in the pan is finished it is merely a question of pulling a lever and the pan automatically tilts over, although the arrangement operating this is designed so that the pan can be tilted at any speed and can be stopped instantly. The machine has a four-speed motor.

The "Q.P." emulsifier made by Ormerod Engineers, Ltd., is for medium quantity production of all kinds of emulsions used in the manufacture of foodstuffs, such as cream made from unsalted butter and milk, mayonnaise, fruit juices, sauces, syrups, etc.

The standard model is driven by a direct coupled electric motor of ¼ h.p., but a belt-driven model is also supplied.

All parts of the machine coming into contact with the product are made from Firth-Vickers' "Staybrite" Steel or a special anti-corrosive aluminium alloy which will withstand any normal chemical action.

It has an output of 20 to 25 gallons per hour, but small quantities can be effectively treated. A hand-operated model for use in the laboratory for experimenting and testing is also available.

PACKAGING

THE "Thrissell" corrugator and complete box-making plant made by the Thrissell Engineering Co., Ltd., opens up many possibilities for individual package making. The machine includes reel stands, corrugating units, an overhead gantry, double facing and combining silicate unit, ironing section, heating and maturing section, crease slitter, and continuously revolving clutchless cut-off. The complete plants are supplied for every form of corrugated material; the plant produces sheets of fine and coarse double-faced and double-double board.

The "Bunn" package tying machine is supplied by the Croxted Manufacturing Co., Ltd. The package is placed on the table of the machine and the engagements of a clutch operated by foot pressure completes the tying in 1½ seconds. The machine is motor driven and ties only one way, but as many different ties as wanted can be made on one package. There is no adjustment for oddly sized packages, the machine being completely automatic.

SIFTING

THE LATEST type patented metal frames render the "Pascall" patent turbine sifter all metal throughout, with consequent advantages. For use on various flours the elimination of "wood moth" is certain, and the metal-type frames last indefinitely and are robust in design. Tacks are eliminated and the screening medium (silk or wire) is securely clamped between rigid side bars, screw fastened to the main frame. A spring steel strip gives sufficient movement to ensure that the frames themselves bed securely on to the bearing surfaces on the machine, eliminating any possibility of leakage of coarse particulars into the fine product.

STERILISATION

A STANDARD machine for the sterilisation of canned meat and vegetables is supplied by Food Machinery (M. and P.), Ltd. A notable feature is the unit which is incorporated for "bringing up" the machine when it is used for sterilising milk and cream. Another, the "Agitating Type Automatic Steriliser," has the agitating feature introduced to assist heat penetration, thereby speeding up the sterilising process and assuring a large output. The introduction of a fully automatic steriliser of the agitating type is an extension of the series of automatic pressure sterilisers to meet the needs of those canners who now regard automatic processing as essential for the scientific treatment of a wide range of food products on a large scale.

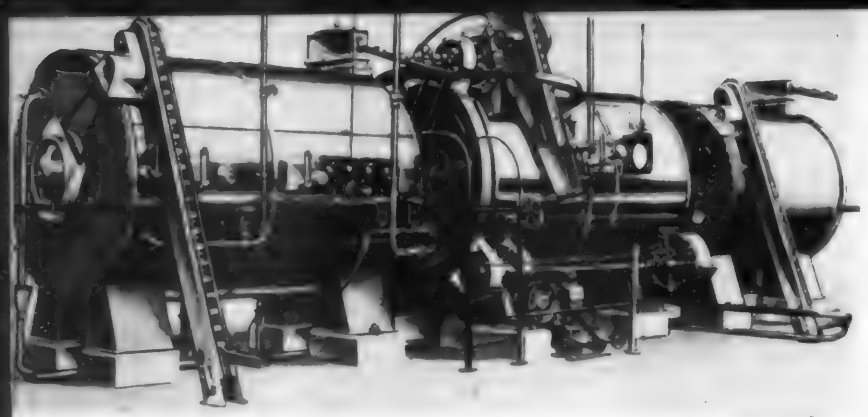
A machine applicable to canned meat processing is the universal automatic retort made by the L.C. Engineering Supplies, Ltd. It handles any shaped can, due to the ingenious system of a series of tiny retorts. Processing time may be adjusted to provide for any normal processing, and the capacity depends solely upon the number of units incorporated. The machine is made up of a series of tubes passing through drums which are mounted on suitable rollers. Each tube is actually an independent retort rotating past loading stations, at which they are charged with cans. Each tubular retort is fitted at both ends with a slide valve operated by a simple mechanism.

A horizontal retort from John Thompson (Dudley), Ltd., has special improvements for ensuring uniform temperatures throughout when heated by steam and by steam and water. It can also be arranged for pressure cooling with water at the close of the process. It is fabricated in mild steel, but the design can be carried out in stainless steel, "Monel" metal, or nickel, or the mild steel can be lined with either of these materials. Robert Kellie and Son, Ltd., of Aberdeen, manufacture standard retorts of all sizes. Geo. Scott (London), Ltd., manufacture retorts to specification.

STOKING

THE METHOD of operation of the "Mirrlees - Combustioneer" automatic stoker made by Mirrlees, Bickerton and Day, Ltd., is simple. Cheap washed peacoal is used. This can generally be obtained just as easily as coke, but is usually cheaper and cleaner. The coal is loaded into the hopper, whence it is transported by a strong worm screw to the bottom of the fire-bed, where the heat releases the volatile gases which, in passing through

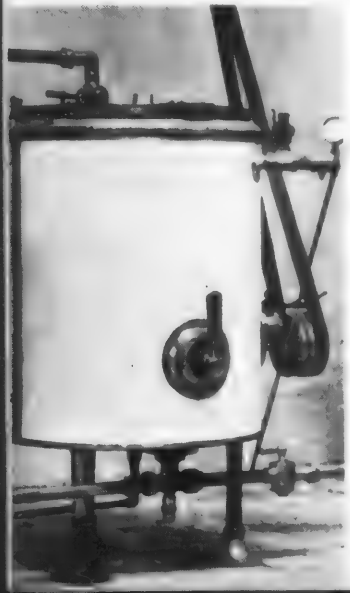
New "Overhung" mixer by the Morton Machine Co., described opposite.



Agitating type automatic steriliser with the agitating feature introduced to assist heat penetration. Made by Food Machinery (M. & P.), Ltd.

F.D.P. "Staybrite" tank by Thompson Bros. (Bilston), Ltd.

"Pfaudler" glass-lined equipment at the United Yeast Co., Ltd., factory.



the top of the fire, are completely consumed. Thus the coal is gradually transformed into coke, and is pushed upwards to the top of the furnace, where it is burned again as a solid, its place at the bottom of the fire-bed being taken by new coal which is moved in. So complete is the combustion of the fuel that only a small proportion of hard clinker is left in the furnace, and removal is both simple and clean. Air for combustion is provided by a forced draught fan, the speed of which may be predetermined and which delivers air through tuyères to the base of the fire.

The amount of fuel delivered to the furnace is controlled by a pressurestat set in the boiler or oven so that not one ounce more or less is delivered than is demanded by the needs of the immediate moment. Even black smoke is consumed, and the last pennyworth of value is extorted from the fuel. Thus cheaper fuel is burned, and considerably less of it. Another consideration is the great saving of labour, releasing the fireman for other duties.

Essential features of the Ruston horizontal "Thermax" boiler made by Ruston and Hornsby, Ltd., are a wet-back combustion chamber and a double set of return tubes, the first of which brings the products of combustion from the combustion chamber to a smoke-box at the front of the boiler, while the second set, arranged low down and near the boiler shell, leads the gases to the rear smoke-box, from which they are taken away to the chimney.

The wet-back combustion chamber reduces radiation losses, and the arrangement of the tubes assists the water circulation and also ensures that the utmost heat value is extracted from the gases. Since the tubes forming the first pass and those forming the second pass are arranged between different tube plates, they are able to expand independently and thus avoid leakages due to distortion of tube plates.

Automatic stokers or oil-burning equipment can be fitted to these boilers, which are offered in sizes from 1,000 lb. evaporation upwards.

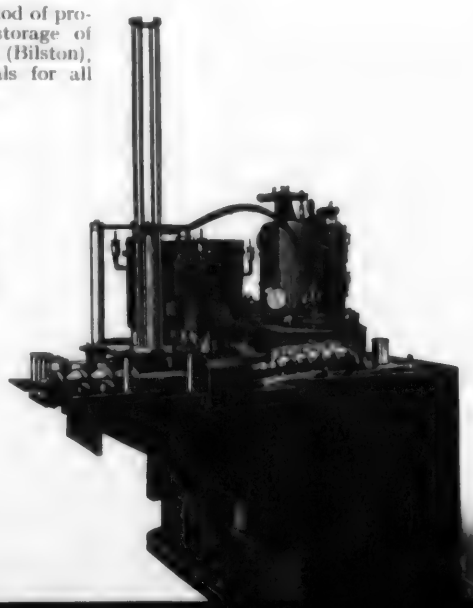
STORAGE

MUCH THOUGHT has gone to the perfection of storage tanks, and present-day equipment makes for the most perfect storage of products during the various processes of manufacture.

With the slogan, "After all there is nothing cleaner than glass," Enamelled Metal Products Corporation (1933), Ltd., present a striking case for their "Pfaudler" glass-lined equipment. Almost every branch of food manufacture uses this equipment. The picture shows "Pfaudler" glass-lined jacketed tanks used by the United Yeast Company, Ltd. In their catalogue is listed examples of "Pfaudler" glass-lined equipment used for mayonnaise, pickles, sauces, chocolate filler, syrups, and coffee essence. They say of glass that it prevents the destruction of delicate and distinctive esters and flavours. Only glass remains inert in the presence of acids, which are responsible for the retention of natural food colour and flavour.

Stainless steel is another method of providing sterile conditions for storage of food products. Thompson Bros. (Bilston), Ltd., make tanks in all metals for all purposes, but are specialists in the manufacture of stainless steel tanks. The picture shows a F.D.P. "Staybrite" tank, part of a battery, with a total capacity of about 25,000 gallons. All inside surfaces are brightly polished.

Patent "C.V." vacuum double seaming machine, type H.L.M. Fully automatic for round cans up to 3⅞" diameter × 5" high. The cans are picked up by a worm from the conveyor band and fed under a multi-headed crimper which positively feeds the lids on to the cans and attaches them with a light curl. Made by Premier Filterpress Co., Ltd.



VACUUM CANNING

"C.V." MACHINES, made by the Premier Filterpress Co., Ltd., enable the highest possible vacuum to be produced without any danger of overcooking either in the case of meats with slow heat penetration or with fruits where the whole permissible cooking time is short. It is recognised that in many cases the presence of oxygen is detrimental. From a purely mechanical point of view the advantages are considerable. The elimination of the exhaustor saves a large amount of floor space and enables the packing rooms to be kept free from steam. The fish canning industry, in which "brogueing" was previously largely employed, is now almost entirely equipped with "C.V." seaming machines. Not only in the canning industry, but in others, do these machines give service, and many other items of food are now under vacuum.

WATER SOFTENING

PERFECTLY SOFT zero water for food manufacture is produced by the Kennicott "Kenzelite" base exchange water softener made by John Thompson (Kennicott Water Softeners), Ltd. Designed to produce soft water by means of a natural mineral known as "Kenzelite", it possesses the property of exchanging sodium for calcium and magnesium in the process of softening water. The actual water supply is designed to employ this material. As hard water is passed through the softening bed an instantaneous exchange takes place, the whole of the lime and magnesia contained in the water being removed.

"Nat-Rol" water softeners made by Watson's Water Softeners, Ltd., employ a durable base exchange material which is guaranteed for five years against depreciation of capacity. An upward flow when softening eliminates the necessity for back-flushing, and minimises the resistance set up in the plant. The main cylinder is heavily galvanised inside and out, and the internal fittings are of gunmetal and copper.

BRITISH FOOD RESEARCH IN 1937

A SURVEY OF THE LATEST ADVANCES IN FOOD TECHNOLOGY

SOME VALUABLE contributions to food research are recorded in the volume recently issued by the Department of Scientific and Industrial Research.

Among a host of experiments on food made in the year 1937 figure matters of such importance as the storage of eggs, pork, fish, fruit and vegetables.

In another place in this issue is given the substance of the Medical Research Council's pronouncement upon the integrity of stored foods.

Work for Herring Industry Board

With regard to fish, two important pieces of work have been undertaken for the Herring Industry Board. The first, dealing with the quality of kippers in relation to the quality of the fresh herrings from which they are made, has been completed and a report furnished to the Board. The second is still in progress, and deals with the freezing and cold storage of herrings.

The development of rancidity in the fat of herrings during cold storage is due to the action of certain enzymes, and experimental evidence suggests that these enzymes are activated by common salt. For this reason, herrings that have been frozen in brine need careful washing and glazing before they are stored, and there would be a clear advantage if freezing could be carried out satisfactorily in air, so that contact with brine would be avoided. It is this possibility that is being explored by the use of plant provided by the Herring Industry Board.

Meat

The low *p*H which is essential to the proper keeping of the flesh of animals can only be ensured if an ample reserve of glycogen is present in the muscles at the moment of death. To this end steps can be taken at two stages in the preparation of the animal—(*a*) in the last few days preceding slaughter, and (*b*) actually on the slaughtering floor.

The first step consists of resting the animals, as is done in present practice, for at least 24 hours after a fatiguing journey. In addition to this rest, it would seem desirable to allow animals a ration of readily absorbed food, such as cane sugar or glucose, rather than to withhold food completely during this period, otherwise there is danger of supplies of carbohydrate falling short.

There is, however, a possibility that E. C. Bate-Smith, in his paper on *The Physiology of Rigor Mortis*, suggests should be explored—*i.e.*, that a substantial increase in glycogen to a value higher than normal occurs during the period of rest following the use of a muscle. There is probably an optimal period following a bout of strenuous exercise during which the muscle glycogen is at a particularly high level, and it might actually be advantageous to force an animal to exercise some days before slaughter. Struggling on the slaughtering floor should be reduced to a minimum. The liberation of lactic acid from muscle glycogen is particularly heavy during exertion of short duration, and while the animal is alive it passes directly into the blood and is lost during subsequent bleeding. The high level of lactic acid in the blood of slaughtered animals shows how wasteful of muscle glycogen is the struggling that takes place on the killing floor. Values between 0·05 to 0·06 per cent. in oxen and 0·05 to 0·11 in pigs have been observed, representing an appreciable loss of acid which would otherwise have contributed to the fall in *p*H of the muscle.

Excitement and fear also lead to rapid glycogenolysis and loss of lactic acid. The ideal method of slaughtering would appear to be electrical stunning of the quietly resting animal, thus avoiding all excitement and most of the struggling. E. C. Bate-Smith gives some curves showing the changes of *p*H in muscle which can now be followed *in situ* by means of a fine spear-shaped electrode.

The action of sodium chloride on the rate of oxidation of hæmoglobin is discussed by J. Brooks in connection with *Changes in Muscle Pigments*. He shows that the rapid discoloration of lean meat after contact with brine is due to an increased rate of formation of methæmoglobin, following the penetration of neutral salts into the tissue. A table is given showing the rate of formation of methæmoglobin with growth concentrations of added sodium chloride.

Bacteriology

The effect of freezing on bacteria is discussed by R. B. Haines and on the basis of experiments with solutions of bacterial protein obtained from the dried ground cells of *B. pyocyaneus* (*Pseudomonas æruginosa*). He suggests that one or two factors are responsible for the death of the bacterial cell on freezing, one unknown, but apparently not mechanical, and the other some change leading to coagulation of the cellular proteins; or else that there is in reality one process, leading to coagulation, but with a time-lag, so that coagulation is not found on immediate freezing and thawing. A full account of this work has been published in the Proceedings of the Royal Society, 1937, B. 124, 451.

Poultry and Eggs

Among a number of valuable papers figures one by J. Brooks and J. Pace on *The Equilibria between Carbon Dioxide and the Egg*. Details are given of the solubility of carbon dioxide in the white and yolk, and

Food Investigation Board's Annual Report, 1937. 266 pp. London: H.M. Stationery Office. 4s. net.

also on the adsorption of carbon dioxide by the shell. The inhibitory effect of carbon dioxide on the growth of moulds is discussed by R. G. Tomkins, and the practical application of the results obtained is that storage in concentrations of carbon dioxide up to 20 per cent. may, in certain instances, encourage rather than restrict the growth of certain moulds. Following on are experiments of A. J. M. Smith, who shows that at a constant relative humidity the rate of evaporation of water from eggs is independent of the speed of the air over the eggs. Preliminary experiments by T. Moran have now indicated that the growth of mould is likewise dependent only on the relative humidity.

Further papers dealt with the *Bacteriology of the Hen's Egg*, by R. B. Haines, and the *Classification of Pseudomonas sp. isolated from Eggs*, by the same author; while the storage of fertile eggs in carbon dioxide and *The Partial Sealing of Eggs* for storage are treated by T. Moran.

Pork, Bacon and Hams

Working on carcases obtained from a closely inbred herd of Large White pigs, the effect of growth on the deposition of fat has been observed by E. H. Callow, who also is responsible for papers on the *Electrical Resistance and Micro-structure of Muscular Tissue* and also *The "Ultimate pH" of Muscular Tissue*. Interesting results have been obtained concerning the fat oxidising enzyme (lipoxidase) of pork, by C. H. Lea.

Lipoxidase of pork has established its presence in both adipose tissue and muscle, and also to some extent in used tank-pickle. The enzyme accelerates oxidation and the development of rancidity in extracted pig-fat, even at temperatures below 0° C. Experiments are at present in progress to determine whether the atmospheric oxidation of fat in the presence of the oxidase can be followed by means of the Barcroft or Warburg technique—*i.e.*, by direct measurement of the volume of oxygen absorbed. Such a method, in permitting a large number of readings to be obtained from one sample of fat, would possess marked advantages over determination of the peroxide value on different samples of fat at different times. Another very valuable set of experiments by the same author is the determination of the potential resistance of the fat of pork to oxidative rancidity. This property becomes of particular importance when the meat is to be stored as bacon or cured hams. Details of a method of measuring the susceptibility are given.

Nitrite in Pickle

The changes in nitrite content of tank pickle when sent over considerable distances has been studied by M. Ingram. The action of antiseptics and the effect of temperature were observed, and it was found that pickle may be stored at temperatures below 10° C. for at least 10 days without appreciable change in its nitrite content. It is proposed, therefore, to transport samples of pickle in thermos flasks without the addition of antiseptics which were not found to have the inhibitory effect desired.

Fish

A knowledge of the nitrogenous extractives of fish and its extension should prove of value in the fields of comparative biochemistry and physiology, as well as in those of the preservation of fish and human nutrition. In most studies of these substances methods of isolation rather than of quantitative estimation have been employed, and work is now being done to see how far it is possible to devise a system of quantitative analysis.

G. A. Reay in his paper on *The Nitrogenous Extractives of Fish* describes various analytical methods.

In connection with *The Rancidity of Fats*, A. Banks describes a method for testing extracts and concentrations, and mentions that efforts are being made to perfect a method of rapidly estimating the activity of concentrates of the enzymes by making use of a sample of cold-stored herrings to secure uniformity of the material from which the enzyme is extracted. Progress in this field has been made chiefly in work concerned with the effect of tissue-enzymes on the development of rancidity in fats.

C. L. Cutting describes the *Electrometric Titration of Haddock's Muscle* with a view to following the course of spoilage in haddocks stored in ice for 20 days. For each estimation 5 g. of muscle were taken from the minced fillets of ten fish and were broken up finely with a high-speed stirrer in 100 ml. of water. The suspension was then titrated, according to Stansby and Lemon's procedure, with 0·0165 N-hydrochloric acid in two stages, A and B. The B value is equivalent to the ml. of acid required to move from *p*H 6, and the A value to the ml. of acid required to move from *p*H 6 to *p*H 4·3. According to the authors of the method, a fall in the A value during storage in ice represents mainly the effect of primary alteration of the proteins (*e.g.*, autolysis) and a rise in the B value mainly the effect of secondary alteration (*e.g.*, production of bases by bacteria). Tables are given showing the A and B values for haddocks that have been stored for various periods.

Which procedure yields the better product—smoking fish after cold storage or cold storage after smoking? This is one of the questions which received special attention during the year. Another is, How far can the quality of exported smoked fish on arrival at its destination be improved by better cold storage in this country without assuming any improvement in the conditions of transport overseas? The paper on *The Freezing and Cold Storage of Smoke-Cured Fish*, by A. Banks and G. A. Reay, describes the experiments designed to answer these questions both in connection with white fish and herrings.

In *The Salt-Curing of Herring*, previous work done has been concerned chiefly with the osmotic aspect of salt-curing, and with the characteristics of experimental light cures. This work is now being extended to include the bacteriology of the process. The results show that high bacterial counts and high values for volatile bases, both in the flesh and pickle, are usually associated with "off" flavours and odours, although this is not always the case. It is noticeable that the true

(*Continued on page* 354.)

RAPID REVIEWS

ANALYSIS OF FOODS — ABOUT CANNING — NUTRITIONAL SCIENCE — MYCOLOGY AND BACTERIOLOGY — OUR DAILY BREAD

The Chemical Analysis of Foods. *By H. E. Cox, Ph.D., D.Sc., F.I.C. 2nd Edition. London. Pp. 329. 21s. net.*

In its second edition this book has been brought up to date by the addition of new methods of food analysis. As is mentioned by the author in his preface to the first edition, he set out to present the elements of the subject and to do that in a manner suitable to the requirements of chemists who have no experience in this branch of their science, although a competent knowledge of ordinary organic and inorganic analysis and familiarity with the usual physical instruments are taken for granted.

The methods for the determination of preservatives, metallic impurities, have been well covered and will be specially helpful to the qualified analyst who is about to specialise in food analysis, as he will probably not have been previously called upon to perform these analyses.

Food analysts will no doubt welcome this handy, up-to-date volume.

Canned Foods and the Canning Industry. *By F. Huntley Woodcock, M.G.I., and W. R. Lewis, B.Sc.(Lond.), F.G.I. London. Pp. 119. 7s. 6d. net.*

Primarily written for grocers, provision merchants and those concerned with the inspection of food, this work constitutes an epitome of canning in all its branches. The treatment is necessarily brief, but a good and, for the most part, accurate notion of canning should result from a careful reading.

There are some trifling inaccuracies which might be corrected in future editions.

Pickling of meat does not abstract moisture from it (page 32), and bacteria certainly do grow in pickle. Beef for corned beef is not cooked for anything like two to three hours before canning (page 33).

On page 29 the cylinder in the centre of the picture should have been full. Hydrometer readings are best made thus, when there is enough liquid available as is evidently so in this case, as some is shown in the measuring glass in the right-hand side.

As has been said, these are very minor points, and the work should prove of value to those for whom it was written and, indeed, to anyone to whom canning has hitherto been a *terra incognita*.

Science and Nutrition. *By A. L. Bacharach, M.A.(Cantab.), F.I.C. Pp. 154. London. 2s. 6d. net.*

The story of the remarkable developments in the field of experimental nutrition during the last thirty years is simply and accurately told by Mr. Bacharach in this very attractively written book, which is intended mainly for the layman. Despite this, the author seems to be beset with the fear of platitudinarianism and suggests that certain chapters on food constituents might either be skipped or treated as a "refresher course". Unless the reader is daily immersed in these matters, they may well be read and read again by chemists as well as laymen.

Space precludes the consideration of the work in detail. Let it be said that the intelligent layman would find it, as the present reviewer did, difficult to put down until the last page is reached. The trouble with technical writing is often that those who know can't express themselves and those who can express themselves don't know! Mr. Bacharach both knows and can write, and has, in addition, a pretty sense of humour. Scientific writers oft-times seem to fear that incursions into the lighter phraseology might, perchance, damage their authority. Here no omniscience is claimed; in fact, some sly digs at "old tags" of physiology may rather disconcert the layman. And in a discussion of the Hay diet the phrase, "I can hardly imagine a more thoroughly effective exposure of the attempt to make Hay diets while the moon shines", is an example of the "wisecracks" which lighten the pages of the book, without in any way lessening its impression of authority.

Applied Mycology and Bacteriology. *By L. D. Galloway, M.A., and R. Burgess, M.Sc., Ph.D. Pp. 186. Leonard Hill Limited. London. 1937. 10s. net.*

The authors state in their Foreword that this volume is intended only as an elementary review of essentials and as an introduction and supplement to the fuller literature quoted. They mention the industrial chemist, who "is expected to cope with any problem from plumbing to entomology". It is to this section of workers (among others) that this book will appeal.

The subject matter is treated in concise, simple language, and the chapters on fungi and bacteria form a useful summary. The isolation and examination of micro-organisms is, as the authors mention, a brief summary of the more important everyday procedures and includes the usual bacteriological operations. In connection with the various individual items of technique, very useful references to recent specialised work are given. A selection of the more commonly employed culture media is given. A useful chapter describes the metabolism of micro-organisms. End-products of the carbohydrates, fats and proteins are described. Disinfectants are covered and a description of the Rideal-Walker test is given.

Food spoilage occupies one of the longest chapters, and the testing of milk, cheese, and other dairy products is given some prominence. Eggs, fruit and vegetable products are similarly treated. The section on canning is short and does not attempt to cover the subject. Cereals, sugar and miscellaneous products are briefly noted.

The fermentation industries, textile industries, hygiene and medicine, and agricultural industries are treated in the clear manner which characterises the entire work, and short notes on timber decay, wood-pulp and paper, rubber, leather, paints, etc., complete an extremely lucid description of the general principles underlying the subject.

Our Daily Bread. *By Sir Daniel Hall, K.C.B., F.R.S. London. Pp. 169. 6s. net.*

If this is the kind of educational book generally available to the young of the present generation, they may be congratulated. The only vestige of knowledge of geographical production remaining from the reviewer's somewhat remote schooldays is about needles being made at Redditch, near Birmingham, an item which has not been notably useful in post-school life!

The matter composing this book, primarily written for educational purposes, is presented in such a way as to be likely to fix the main sources of common foodstuffs in the student's memory.

The facts are stated in a readable and lucid style, and yet there is no suggestion of "writing down" to the young reader.

The pills of figures for production and imports of the various commodities are well coated with copious illustrations of the descriptive sort—such as different sized baskets of eggs representing the different sources and quantities. A number of maps showing the distribution of cattle, sheep, vegetables, etc., should help to strip geography of most of its terrors.

Mr. Lloyd George, writing of this book, says: "Had such a book been available fifty years ago, it would have increased our food production and stemmed the flight of labour from the land by arousing an intelligent interest in the problems of the soil". Perhaps there is still time.

T. C.-W.

Mixing in the Food Industry

(*Continued from page* 342)

food tablets the broken spiral type not only kneads the materials, so assisting the fluid to displace air entangled with the dry powders, but moves the material from one end of the container to the other, and so more rapidly produces general and uniform mixing. The blades also scrape material away from the container wall, an operation impossible with the paddle-type agitator.

3. Turbine Mixers.—Turbine mixers have only a restricted use in the food industry because of the necessity and difficulty of adequately cleaning the mixing element, which is of very complicated shape. As a class of mixer they are very efficient when used for all types of liquids. Their action is similar to that of a centrifugal pump. Material is drawn into the mixing element by the impeller axially, and is discharged at high velocity in a tangential direction by the vanes. A stationary curved ring or "crown" is fitted to deflect the leaving stream. There is very little loss of kinetic energy because the change of direction of the fluid stream from the vertical to the horizontal is made smoothly. The fluid streams leaving the turbine have high velocity and so reach the periphery of the container. When properly designed, the type can successfully be used for large-capacity tanks, even suspending solid material of high density. For rectangular tanks and for cylindrical tanks mounted horizontally, because their high velocity streams reach the remote parts of the containers, turbine mixers should always be used. They are superior to all other classes of mixers except colloid mills and homogenisers for the production of dispersions.

4. Miscellaneous Mixing Types.—Under this heading fall two classes of machines, homogenisers and colloid mills. They are not strictly mixers, but are dispersers, as they produce the finest particle size. The names are used somewhat indiscriminately.

4 (a). Homogenisers. — Homogenisers are essentially high-pressure pumps which force the liquid materials past a disc or valve held against a seating by a spring. The pressures are of the order of 1,000 lb. per square inch, and the valves were constructed previously of agate, but are now made of nickel steel.

4 (b). Colloid Mills.—This type of machine consists basically of a high-speed rotor in an outer casing, with a clearance of the order of 0·001 in. Liquids of medium and low viscosity are passed through the space between the rotor and the casing, and extremely fine dispersions are produced. The rotor is in some cases grooved, and then intense shear is produced on the fluid particles. The modern tendency is to adopt rotor shapes that restrict the great centrifugal force developed, and which limits the time the material is acted upon in the mill. The first cost of these machines is high in comparison with other classes, and the horse-power consumed is also high, being about 0·2 to 0·5 h.p. per gal. per hr. Both the homogeniser and the colloid mill classes are not very effective with liquids of high viscosity.

Power Transmission to Mixers

Most mixers of modern design are built with individual drives, and line-shaft drives are being displaced. Such substitution results in cleaner machines and cleaner factories. Where the motive power has to be above the container, totally enclosed electric motors now make for cleaner design. Variable speed drives are adopted in those cases where the speed of the mixing element controls the degree of mixing. The speed variation is obtained either by multi-speed gears or multi-speed pulleys—now the cheapest method. The drives are by **V**-rope or **V**-flat belts. Where speed reduction has to take place, the use of the gear-head motor is replacing speed reduction through bevel gears, as the former is much cleaner and neater.

British Food Research

(*Continued from page* 351)

"cured" flavour occurs only in the more heavily salted fish, the most lightly salted fish having either a "green" or a flesh flavour.

The authors observe that it is impossible to come to any definite conclusion, from the results so far available, as to whether the production of the true "cured" flavour is attributable to the action of the tissue-enzymes or to that of a controlled flora. However, it is clear that certain floras—for example, those present in the lighter cures examined here—are probably to be regarded as agents of spoilage rather than of curing.

Fruit and Vegetables

The study of the apple's respiration has brought to light a new fact of some practical importance. Just before the onset of the climacteric rise in respiration apples exhibit, on exposure to concentrations of carbon dioxide up to 15 per cent., a temporary increase in activity which may amount to as much as 100 per cent. This means that in all forms of cold storage, both on land and at sea, the possibility of carbon dioxide accumulating to dangerous levels is greater in the period immediately after the fruit has been put into store, especially if it is warm, and is on that account respiring rapidly, than had hitherto been thought possible. This is treated in a paper by F. Kidd and C. West.

Of topical interest are the papers by T. N. Morris and J. Barker, dealing with the freezing of peas and other vegetables. The authors cover most of the operations, such as the selection of peas for ripeness and variety, duration and temperature of scalding, etc.

Studies on *The Corrosion of Tin and the Corrosion of Aluminium*, by J. M. Bryan, are included in the canning section.

Other subjects are *The Storage of Strawberries for Canning*, by T. N. Morris; *The Effect of Sulphurous Acid on the Setting Power of the Pectin of Heated Fruit Pulps*, by the same author; and *The Utilisation of the Peel in the Canning of Apples*, by S. S. Silva and T. N. Morris.

In the final section on Engineering a considerable volume of work is reported.

NEWS FROM THE INDUSTRY

450,000 Tons of Sugar in a Year

The Sugar Commission's report for the year ended March 31 states that provision is made for a total white sugar production (campaign and off-season) of 450,000 tons in the proposals submitted by the British Sugar Corporation for 1938-39. The Commission found reasonable the allocation of the estimated production between the various factories and the marketing arrangements.

Resulting from unco-ordinated development of the beet sugar industry before amalgamation, it appears to the Commission that there is a certain lack of correlation between beet supplies and factory capacity. Advantage should be taken of the unification of control to survey the position and to estimate financial effects of schemes for adjusting factory operations in relation to location of beet supplies and the market for the Corporation's products.

* * *

Tragic Death of Samuel Schwarz

With but four months to go before participating in the firm's Jubilee celebrations, Mr. Samuel Schwarz, managing director of N. V. Polak and Schwarz's Essencefabrieken and director of Polak and Schwarz (England), Ltd., died of pneumonia at Amsterdam, on September 11.

Well known and extremely popular in the essence business, Mr. Schwarz joined the company in 1912. His death at 43 is a very real and personal loss to both his company and his many business friends. He leaves a wife and three children.

The funeral was on September 14 at Westerveld, Holland.

* * *

B.I.F. Calls the World

"Big Ben", with Boadicea's statue in the foreground, is a striking and appropriate decoration for a B.I.F. menu card, 195,000 of which will shortly be distributed in seven European countries; in the Argentine, Chile, and Brazil; in the British West Indies, and British East Africa.

This card, printed in nine languages, will also be used on British and Continental airway lines and on cross-Channel and other steamship services to the Continent. Thirteen thousand illustrated cards, printed in eight languages, will be issued to nine countries, and 3,000 B.I.F. blotters are being sent to Italy for distribution to Italian firms.

Fifty Years of Pioneering

Born in Offenbach in 1862, a certain Fredk. Boehm, after a few years' experience in a London merchant's office, started an agency under his own name to deal in chemicals, in Billiter Square Buildings, London. This, 50 years ago, was the unpretentious start of an organisation now known throughout the food and allied industries.

To celebrate its fiftieth birthday, Fredk. Boehm, Ltd., have issued an imposing booklet which follows the fortunes of the company through those fifty years. Highlights of the Fredk. Boehm, Ltd., history start as early as 1890, when the concern was one of the first to sell chemically pure glycerine. In 1904, during the Russo-Japanese War the company shipped 1,500 tons of olive oil to meet the Russian Black Sea Fleet at Alexandria.

The agency of Fredk. Boehm became a private limited company in 1908 with a capital of £60,000.

The Great War profoundly changed the history of the company. Continental connections were severed and a new trade had to be built up. It was decided that the vegetable oil and fat trade offered the best scope for development. An interest was acquired in the Edmonton Vegetable Oil Extraction Corporation which strengthened the company's connections with world consumers of oils and fats.

The sole U.K. distribution of the edible oils and fats made by Aarhus Oliefabrik S.A. of Denmark for confectionery and margarine was taken over in 1917. The death of Mr. Fredk. Boehm, the founder, in 1924 was a tremendous blow to the company. In his place as chairman and managing director came Mr. H. Kunzer, who had been with the business since 1890.

In 1930 at Plaistow a factory was erected for the production of "Protex" vegetable extract. In 1931 lecithin was produced for the first time on a commercial scale from the soya bean. In 1935 the company secured the agency for the sale of Thomas Hedley and Co.'s glycerine, of which was produced several thousand tons per year. In 1936, in conjunction with English Grains, Ltd., a plant was started at Burton for the production of yeast extract. In 1937 a factory was started at Crediton, Devon, to produce milk chocolate crumb.

So now with the whole or part control of six factories and a pioneering record of 50 years, Fredk. Boehm, Ltd., can look with pride to the initiative of their founder, his contemporaries and his successors.

* * *

600 Years at Bournville

Some idea of the size of the Bournville staff can be gleaned from the fact that this last month's retirements totalled between 600 and 700 years of service. Eight had over 20 years, four between 30 and 40 and four over 40.

Mr. A. Field has an especial interest among recent retirements at Bournville. When he left the cocoa presses for the last time at the general holiday he had the distinction of 47 years' continuous service—a record.

The list includes Mr. W. J. Harris, Mr. H. Kimberley, Miss K. Wood, Mr. W. G. Perry and Mr. A. L. Nash.

* * *

On page 314 of the September FOOD MANUFACTURE, a picture called "a test baking oven" was wrongly described. The picture was actually of the Simon Temperature-Controlled Fermentation and Proving Cabinet made by Henry Simon, Ltd.

New Oscillating Granulator

The new Stokes oscillating granulator is of great assistance in making uniform granulations required in the food and pharmaceutical industries. It can be used for both dampened and dry materials. Finely powdered materials can first be dampened with a granulating fluid and then passed through the granulator. The dampened materials are rubbed through wire screens by the oscillating motion of a set of rolls to form granules, which are then dried, usually in compartment dryers, on trays. Practically all the food and pharmaceutical granulations can be made with this machine, and the subsequent drying and tablet compressing operations are then carried out very rapidly. In the manufacture of malted milk tablets, cocoa tablets, coffee tablets, rennet tablets and salt tablets the granulator is a very efficient and cost-saving machine.

Course in Bacteriology and Mycology

Part author of the book *Applied Mycology and Bacteriology*, published at the end of 1937 by Leonard Hill Limited, L. D. Galloway, M.A. (Cantab.), will be giving an evening course of instruction in Industrial Bacteriology and Mycology at the Hackney Technical Institute, Dalston Lane, London, E. 8. The class will meet every Friday between 7.15 and 9.30 p.m. After an introduction covering the historical development of microbiology and the systematic position of fungi and bacteria, Mr. Galloway will deal with bacteria, fungi, laboratory technique, metabolism, enzymes, antiseptics and disinfectants, control of harmful organisms, food industries, fermentation industries, agriculture, etc., and their relation to the subject.

* * *

Maynards' Profits Fall

A net profit of £37,504 for the year ended June 30 was earned by Maynards, Ltd., the confectioners, as against £45,735 for the previous year. The directors have transferred £2,000 (against £6,000) to premises improvement reserve, and they recommend a dividend of 8 per cent. on the Ordinary shares (unchanged), payment of which will leave £28,431 to be carried forward (against £29,360). Floating assets amount to £183,653 and current liabilities to £54,540. Meeting, September 21.

* * *

Roche Move to Welwyn

The future only address of Roche Products, Ltd., will be Welwyn Garden City, Herts. This address is of Roche's new offices, factory and research laboratories, " . . . unique in structure and design . . . perfect in modern equipment ". The new factory has the first plant in the British Empire for the production of vitamins B_1 and C (" Benerva " and " Redoxon ").

* * *

Prices of G.E.C.'s Osram lamps have been reduced. New prices are: 100 watt, 2s.; 75 watt, 1s. 10d. This reduction, which includes several others of the range, will, it is hoped, result in a higher standard of factory illumination.

* * *

Modern Anglo-American Cakes

The illustrations to this article, which appeared in our September issue, were by the courtesy of *Covo Refining Co., Ltd.*, and not as stated.

Continuous Inspection and Examination of Foods

A comparatively new development in the control of food manufacture is the use of X-rays for discovering any foreign bodies that might accidentally enter them.

The need for keen, rigid inspection is particularly well-known to manufacturers of food products. The usual inspection methods serve to check conditions at certain points in the manufacturing process, but when it is necessary to determine conditions *inside* the finished product X-ray alone provides a satisfactory method. X-ray inspection is a non-destructive test that helps to locate flaws concealed by good external appearance. It can be carried on swiftly and accurately during production. It is possible to detect various materials or substances within a product simply by passing that product between a source of X-rays (the tube) and the viewing screen and watching the image on the screen. Since the images of foreign materials will have the same relative positions on the screen as the materials themselves have in the product or substance under inspection, it is a simple matter to determine their location exactly and remove them without disturbing unaffected products. The X-ray unit consists of X-ray tube and transformer immersed in oil in a steel tank. For electrical protection the goods are placed on to a conveyor belt on the top of this tank and the X-rays pass from the goods on to a fluorescent screen which itself has X-ray protection in the form of lead glass; the tank is placed in a lead-lined enclosure to complete the protection.

Fig. 1.

The applications are numerous. In confections the method has been found extremely effective. Offending particles of foreign substances are omnipresent in every plant and would include particles of copper kettles, steel from slabs, bits of worn conveyor belts, hard pieces of dirt or shells from supplies of nut meats, etc.

Packed boxes pass through the X-ray inspection equipment at the rate of 25 to 30 per minute. A package of sage and onion stuffing containing iron particles is shown in Fig. 1. Disease in plums can be readily detected, as is shown in Fig. 2. As has been said, this system is characterised by its versatility. Containers of metal, paper, or other types may be checked. The presence of foreign materials in the containers and also in the batch may be ascertained. Fruits, vegetables, and raw materials in bulk fall within its scope, and the location of defects in individual pieces or small packages to save waste of an entire batch known to contain a few isolated pieces of foreign substance may be effected.

The manufacturers are the Victor X-ray Corporation, Ltd., of 15-19, Cavendish Place, London, W. 1.

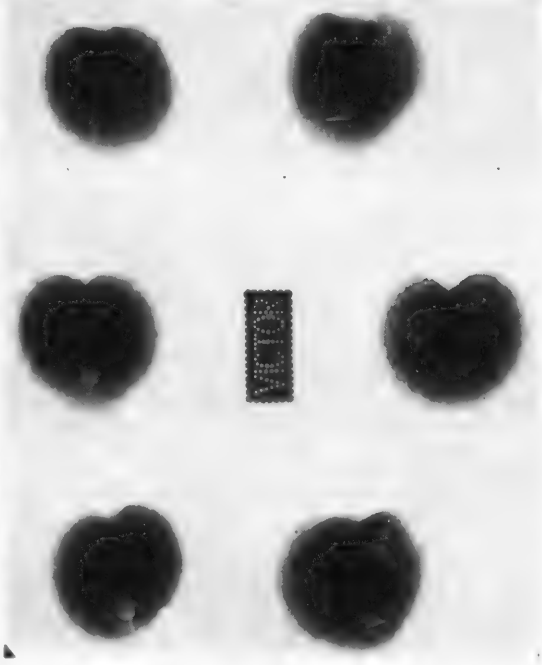
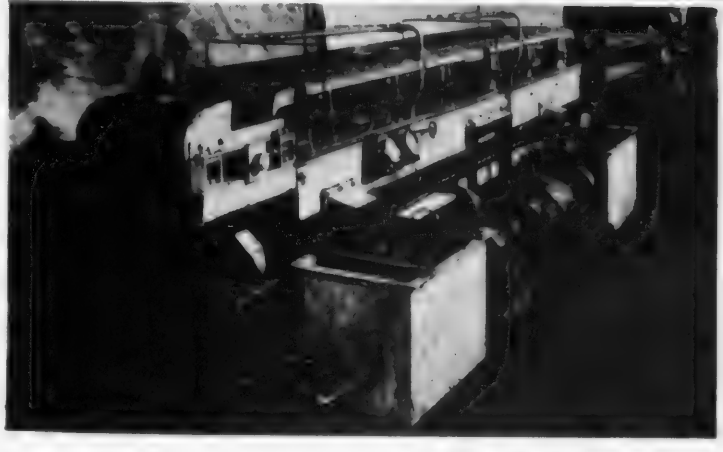


Fig. 2.

On the left is shown the complete new filter. Below is a diagrammatic view of a section which illustrates its method of operation.



Clean Containers

The absolute cleanliness necessary for all containers of foodstuffs makes the "Worssam" continuous hydro-washer, drawn above, a machine of especial interest. This is made by G. J. Worssam and Son, Ltd., and has been specially designed to wash and rinse wide-mouth glass containers. The jars are carried on a chain made up of special gunmetal slats and in their passage through the machine are washed with detergent, rinsed with hot water and finally passed over steam jets for drying and sterilising the interior and exterior surfaces. Built to suit a number of sizes of containers, the machines can deal with varying outputs.

A New All-Metal Filter

Experience has shown that efficient filtering is one of the most important safeguards to ensure long life and reliability in all kinds of engines, and to improve the manufacturing efficiency and safety in many important industries.

During the past ten years the demand for filters has gone up in leaps and bounds. Every internal-combustion engine in cars, aeroplanes, large ships, small boats, power stations and compressors in air and gas compressing plants has at least three or four filters for air, fuel and lubricating oil.

Existing filters—of gauze, cloth, paper and edge filters—suffer from important disadvantages. The "Flexo" filter was evolved with a view to overcoming the various disadvantages inherent in existing ones and to conform as nearly as possible to the characteristics of the ideal filter.

Briefly, the "Flexo" filter cartridge consists of a number of flexible discs, some of them flat and some with turned-up edges mounted alternately in a pile and slightly pressed together. The pressure of fluid on one side of the discs causes them to flex slightly, thus forming fine clearances between the flat discs and the turned-up edges of adjoining discs, allowing the fluid to pass through these clearances. These clearances can be easily regulated, first by the quantity of fluid which is allowed to pass through them and also by altering the initial compression on the discs, which can be adjusted by altering the number of discs in the cartridge. Initially there is no clearance between the discs, consequently it is obvious that there can be no limit to the fineness of filtration, which depends on the size of the clearances. If coarser filtration is required the quantity of passing liquid can be increased and no alteration to the construction of the filter is necessary. If the unit cartridge in which the discs are mounted is horizontal, the disc surfaces will be vertical and thus all the dirt collected on the disc runs off into the sump provided for the purpose. In this case the direction of flow is from outside to the inside.

Discs can be made of a great variety of materials such as hardened steel, stainless steel, copper, brass, bronze, nickel, aluminium, glass and plastics and are practically indestructible.

The self-cleaning properties of the filter are stressed by the manufacturers, who are Flexofiltration, Ltd., of Dorland House, London, S.W. 1, who will also market the filter. Three standard products models will shortly be available, varying in capacities from 50 to 800 gallons per hour. The company's new factory at Slough is now nearing completion.

INFORMATION and ADVICE

Mincemeat — Mustard Dressing for Pickles — Beef Dripping Substances — Ice Cream Machines — Covering Substance for Export Hams

Mincemeat

4,276. *We should be pleased if you could supply us with a recipe for mincemeat.* (Wales.)

You might experiment with the following recipe:

Dried apples ..	120 lb.	Cinnamon ..	1 lb.
Muscatels ..	20 ,,	Allspice	1 ,,
Currants ..	10 ,,	Salt	3 ,,
Brown sugar ..	40 ,,	Tartaric acid ..	1½ ,,
Flour	20 ,,	Molasses	2 gal.
Glucose ..	2 ,,	Caramel	5 pts.

Prepare fruit as for wet mince, steam currants and raisins, dip apples in cold water and chop very fine. Start machine, and place therein sugar, flour, followed by other ingredients; then add apples and balance of fruit. When well mixed, add molasses and caramel previously stirred together, and make a mass. Turn out of machine, form in cakes, and wrap in waxed paper.

Mustard Dressing for Pickles

4,301. *Can you please supply me with a recipe for a first-class mustard dressing for pickles?* (Blackpool.)

The following is a first-class mustard dressing for pickles:

Yellow seed	100 lb.
Yellow bran	20 ,,
Salt	50 ,,
Turmeric	4 ,,
Ground cinnamon	12 oz.
Ground cloves	12 ,,
Ground cayenne	12 ,,
Ground nutmeg	8 ,,
Gum tragacanth	4 lb.
30-"grain" white vinegar ..	135 gal.

Soak the tragacanth in water overnight and add to the batch and grind twice. Some mix the gum with the dry spices and grind without soaking. Label as containing added bran.

Beef Dripping Substances

4,267. *We want a substance to utilise with beef dripping. This substance must of course be an edible compound, and the blended product is to be used by the catering and baking trade.* (Manchester.)

We think the best course for you to take would be to submit a sample of the product you wish to copy to an analyst, and ask him to match it. We shall be pleased to recommend a competent analyst if you so wish.

Ice Cream Machines

4,375. *Will you please send us the addresses of the firms who are supplying and dealing in ice-cream making machines for an ice-cream making industry, and also please let us know if there is any book written on ice-cream making industry with some kinds of formulæ and how to get it?* (New Delhi.)

The names of firms were given, and also an ice-cream bibliography.

Covering Substance for Export Hams

4,385. *Can you please give us a recipe for a covering substance for export hams? Is there a somewhat similar substance used for smoked sausages, and, if so, can you please give us particulars?* (London.)

The following recipe was given in FOOD MANUFACTURE, May, 1934:

A gelatin dip for smoked meats is made as follows:

Edible gelatin	25 parts
Glucose	35 ,,
Water	40 ,,

Place the gelatin and glucose in a jacketed pan and mix, having the temperature of the water in the jacket a little higher than lukewarm. Then add the water to the gelatin and glucose, mix well, and raise the temperature gradually to not less than 130° F. and not over 150° F. Cook for 1½ to 2 hours. Wipe each piece of smoked meat carefully to remove surplus grease, salt, etc., then dip into the glaze momentarily. If necessary, the pieces may be dipped a second time. Then let them hang over the kettle so that any drip may be recovered. This will give a transparent, resilient and amply tough covering to resist damage in reasonable handling. The meats may then be wrapped and shipped in the usual way.

There is also a glaze for sausage and meat loaves; the glaze may be made as follows:

Gelatin	2¼ lb.
Sugar	2 ,,

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NEW COMPANIES

Henry Brown (Meat Salesmen), Limited. (343712.) August 25. 12, Abattoir Chambers, Tack Street, Manchester. Butchers, meat salesmen, etc. £5,000. Dirs.: W. R. Brown, 4, Edge Lane, Chorlton-cum-Hardy, Manchester; R. H. Brown, Moss Bank, 30, Whalley Road, Whalley Range, Manchester.

Harding and Sons (Bakers), Limited. (343711.) August 25. 1,526, Coventry Road, Yardley, Birmingham. Bakers and confectioners. £30,000. Permt. gov. dir. and ch.: E. Harding, Packwood Grange, Dorridge, Warwickshire.

D. Hawkins, Limited. (343780.) August 27. 81, Uxbridge Road, Shepherd's Bush, W. 12. Purveyors of cooked meats, etc. £2,000. Dirs.: G. C. Hawkins and Mrs. D. J. Hawkins, 74, The Lawn, Shepherd's Bush Green, W. 12; S. S. Davies, 356, Uxbridge Road, W. 3.

Hesketh's (Northwich), Limited. (343414.) August 15. Wincham Mills, Northwich, Ches. Bus. of millers, etc., at Northwich as "J. K. and W. Hesketh". £20,000. Dirs.: W. Fithon, Redoot, Lostock Gralam, Northwich (permt. gov. dir.); W. Painter, Crofton, Mereheath, Davenham, Northwich.

Pears and Elliott, Limited. (342919.) July 27. Grocers and provision mchts., etc. £8,000. Permt. dirs.: J. J. Reed, Penrith; F. T. Kenyon, Penrith.

Frank Rawcliffe, Limited. (339819.) April 30. Bakers and confectioners. £3,000. Dirs.: F. Rawcliffe, Mrs. H. Rawcliffe, High Street, Ludgershall, Wilts.

Reckitt and Colman, Limited. (341605.) June 20. To acquire the undertakings and assets of Reckitt and Sons, Ltd., and J. and J. Colman, Ltd., or any parts thereof, and to carry on the bus. of mnfrs. of starch, blue, polishes, and mustard, etc. £100. Dirs.: A. Reckitt, 40, Bedford Square, W.C. 1; Sir J. Colman, Bt., Gatton Park, Reigate, Surrey; Sir P. B. Reckitt, Bt., A. Reckitt, A. R. Cleminson, and eleven others.

Laurie Sharp, Limited. (340985.) June 2. 11, Queen Victoria Street, London, E.C. 4. Mnfrs. of and dlrs. in confectionery, cakes, etc. £2,000. Dirs.: H. A. Crowe, Brooklands, Brockham Green, Betchworth, Surrey; Mrs. L. Sharp, 4, Ladbroke Grove House, London, W. 11.

Smyths (Confectioners), Limited. (342692.) July 20. Bakers and confectioners. 146, Cleveland Road, and 24, Blandford Street, Sunderland, and 4, Saville Row, and 146, High Street, Gosforth. £3,000. Permt. dirs.: Catherine Smyth, 179, Cleveland Road, Sunderland; W. R. Smyth, Strathmore, Barnet View, Sunderland.

Stent and Lintorn, Limited. (342784.) July 22. Butchers, etc. £6,000. Permt. dirs.: W. V. Stent, 148, Canberra Road, Charlton, London, S.E.; A. E. Emus, 190, Bromley Road, Beckenham, Kent.

Strathclyde Distilleries, Limited. (340668.) May 25. Distillers, grain distillers, wine, spirit, beer, and porter mchts., etc. £100,000. Dirs.: To be appointed by the subs.

Unicream, Limited. (340546.) May 21. 27, Brazennose Street, Manchester, 2. Mnfrs. of and dlrs. in milk, milk products. £5,000. Dir.: J. Jaffe, 27, Brazennose Street, Manchester.

Ward's (Bognor Regis) Minerals Company, Limied. (342583.) July 16. Merchant Street, Bognor Regis, Sussex. To take over the bus. cd. on at Bognor Regis as "Ward's Table Water Co." £5,000. Permt. dirs.: A. E. Cheney, Chanctonbury, Victoria Drive, Bognor Regis; R. G. Goodacre, Artannes, Linden Avenue, Bognor Regis; D. Headland, Langlands, Esplanade, Bognor Regis.

White's Market (Sunderland), Limited. (342651.) July 19. 4, Frederick Street, Sunderland. Ice-cream mnfrs., café and market proprs. £10,000. Dirs.: W. H. Hope, T. Forsyth, and T. D. Edwards.

Willis's Stores (Norwich), Limited. (340075.) May 7. 58, Wolfe Road, Norwich. Grocers and butchers, etc. £2,000. Dirs.: W. H. Willis, Muriel Willis, 58, Wolfe Road, Norwich; R. J. Flint, Hightree Stores, Walton-on-Naze.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

AMLO.—586,802. **Malt flour.** SUNVI, LTD., Station Road, Mirfield, Yorkshire. August 17.

CONA.—585,903. **Coffee.** "CONA," LTD., Pirelli House, 343 to 345, Euston Road, London, N.W. 1. (By Consent.) August 17.

THE CORNISH CHOUGH. — 585,395. **Biscuits, sweetmeats, cream and butter.** COLLINS CREAMERIES, LTD., 1, Quay Street, Truro, Cornwall. August 17.

HAYCO.—585,645. **Jelly creams, jellies (for food), baking powder, mincemeat, custard powder, blancmange powders, and cake mixtures.** THE HAYES MANUFACTURING CO., LTD., 10, Chichester Avenue, Nelson Village, Cramlington, Northumberland. (By Consent.) August 24.

HONESTY.—586,819. **Substances used as food or as ingredients in food.** H. AND T. Walker, Ltd., 37, Eastcheap, London, E.C. 3. August 17.

KAN-TING.—586,447. **China tea.** HARDEN BROTHERS AND LINDSAY, LTD., 30 to 34, Mincing Lane, London, E.C. 3. August 31.

MONK BRAND. — B 585,584. **Sardines.** ÉTABLISSEMENTS EMILIEN BIGEON, 45-47, Rue de Dijon, Bordeaux, Gironde, France. September 7.

User claimed from January 1, 1908.

OLD MILL.—584,176. **Oranges, grapefruit and lemons.** THE JAFFA CITRUS CO., LTD., 120, Allenby Road, Tel-Aviv, Palestine. (By Consent.) August 31.

PEASANT. — 586,009. **Dried currants.** BRITISH MERCHANTS, INC., LTD., 32, Lime Street, London, E.C. 3. September 7.

User claimed from the year 1927. Section 12 (2).

SILVER SEAL. — B 579,905. **Oranges, lemons and grapefruit.** MUTUAL ORANGE DISTRIBUTORS, Corner of Brookside and Grant Streets, Redlands, California, United States of America. (Associated.) September 7.

SONJA.—585,491. **Canned fish.** GEORGE HARTLEY HAXFORTH, Houghton, 234, Creighton Avenue, East Finchley, London, N. 2. July 13.

Canned fish and goods of the same description will be struck out from the goods of Registration No. 388,746 (2143) if and before the applicant's mark is registered.

SUN TIPPED. — 584,805. **Macaroni, noodles, vermicelli and spaghetti, all being pastes for food.** LES USINES FRANCOBEL SOCIÉTÉ ANONYME, 84, Rue de la Tombe, Mont sur Marchienne, Belgium. (By Consent.) September 7.

TAS.—583,535. **Fresh fruits and vegetables (for food).** JOHN A. STOKDYK, LTD., 15, King Street, Covent Garden, London, W.C. 2. (By Consent.) July 6.

THREE HEADS. — 586,251. **Coffee, chicory, mixtures of coffee and chicory and coffee essence.** QUICK, REEK AND SMITH, LTD., 5, Mark Lane, London, E.C. 3. September 7.

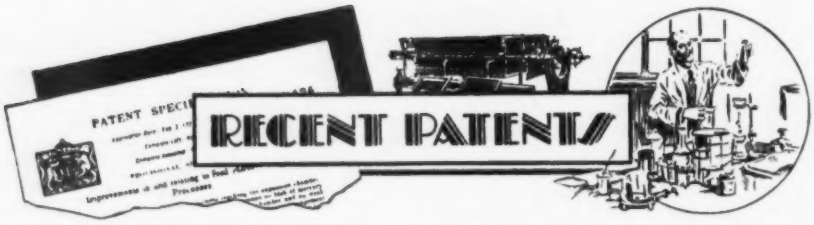
TRUEBLUE. — 583,211. **Compound lard and margarine for use as food.** THE PEERLESS REFINING CO. (LIVERPOOL), LTD., 49-71, Cheapside, Liverpool, 2. July 27.

VICTORY.—586,202. **Peas (for food).** UNITED CANNERS, LTD., 40a, Norfolk Street, Boston, Lancashire. (Associated.) July 20.

VITAPLUS. — 585,117. **Biscuits, shortbread, cakes, and chocolate.** WILLIAM CRAWFORD AND SONS, LTD., Fairfield Biscuit Works, Binn's Road, Liverpool. (By Consent.) July 6.

VOLUTEX.—584,641. **Articles of food made from flour.** CHELSEA FOOD PRODUCTS, LTD., Chelsea Wharf, 15, Lots Road, Chelsea, London, S.W. 10. June 29.

WEETABIX. — 586,040. **Wheatmeal biscuits.** WEETABIX, LTD., Weetabix Mills, Burton Latimer, Kettering, Northamptonshire. (Associated.) August 17.



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Latest Patent Applications

23913. VERDEGAAL, S. J. M. J. (SCHOUTEN): Apparatus for grading fruit, etc. August 13.

23919. PAYS, A.: Manufacture of pastes. August 13.

24144. SCOTT, W. E.: Apparatus for roasting coffee, etc. August 16.

24158. KRONBERG, N. M.: Manufacture of milk powder. August 16.

24253. NISSEN, J. E.: Device for screening, etc., materials such as sugar, etc. August 17.

24284. DU PONT DE NEMOURS AND CO., E. I.: Coating compositions for fruit, etc. August 17.

24360. HUZENLAUB, E. G., and ROGERS, J. H.: Treatment of rice. August 18.

24398. SCHMIDT, H., and ATOMISED FOOD PRODUCTS, LTD.: Production of food powders. August 19.

24462. BAGSHAWE, B. W.: Method of extracting sugar from sugar canes. August 19.

24474. PLEWS, W. J.: Treatment of soya beans. August 19.

24557. AMMANN, P.: Obtaining alimentary substances from edible oleaginous grains, etc. August 20.

Complete Specifications Accepted

489,957. ALLPORT, F.: Edible glaze covering and/or lining for foods hermetically sealed and preserved in containers.

489,970. ATLANTIC COAST FISHERIES CO.: Vitamin product.

490,001. ATLANTIC COAST FISHERIES CO.: Vitamin product.

490,508. CHAMBERS, P.: Apparatus for grading fruit and vegetables by size.

490,557. GREEN, H. J., and GREEN AND CO., LTD., H. J.: Table jellies.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

479,585. **Sugar.** LAMBINON, G.

Sugar juices are treated with an oil emulsion, the amount of oil being less than 30 litres, and preferably 5 litres, of oil to 1,000 litres of juice, then concentrated and heated to produce crystals from which the mother liquor is drained. The oil, mineral or vegetable, may be added as such to the juice, the emulsion being formed by the boiling during concentration. The crude sugar juices from the extraction process may be thus treated without any initial purification. The mother liquor may be flocculated with alcohol, the precipitate being separated and dried or mixed with pulp, chopped straw, oil cake and the like to form an animal fodder.

479,681. **Preserving food.** CROSSE AND BLACKWELL, LTD., and SUMNER, C. G.

Tinplate food containers are treated to remove surface impurities from the tinplate by anodic treatment followed by cathodic treatment. It may then be provided with a protective film by a final anodic treatment, or it may be coated with lacquer by a roller, by spraying, or by electrodeposition. The preliminary treatment may be effected in ammonia or ammonium carbonate with high current density and vigorous evolution of gas; anodic oxidation may be effected in the same electrolyte, but with lower current density. Anodic oxidation may also be effected in a solution of sodium or potassium dihydrogen phosphate or monohydrogen phosphate, or a neutral mixture of dihydrogen and monohydrogen phosphates. Lacquer may be electrodeposited from an alkaline emulsion over an anodic oxide coating. The operations may be applied to the treatment of the tinplate food containers, particularly the inside thereof, in rapid sequence. Specification 479,746 is referred to. Specification 455,810 (Group XXXVI) also is referred to in the Provisional Specifications.

480,871. **Preserving peas, beans, lentils, etc.** TRIGGS, W. W. (FABRIQUE LORRAINE DE LÉGUMES SECS DÉCORTIQUÉS L. CAHEN).

Edible vegetable products which have been previously dried to preserve them, such as dried peas, beans, and lentils, are heated, together with an aqueous solution of salts containing sodium or magnesium and hydrogen, carbonate and phosphate ions to between about 40° to 60° C. The treatment may also be applied to fresh vegetable produce such as fresh haricot beans or small peas previous to drying to preserve them. In an example dried peas are treated in a steam-heated double-bottomed vessel with an aqueous solution containing 2 to 4 per cent. by weight of sodium phosphate and sodium bicarbonate, which are in equi-molecular proportions. The solution is raised to 50° to 60° C. before pouring it over the peas, and thus temperature is maintained for 3 hours by heating slightly at intervals. The mass is allowed to return to room temperature and to soak for 17 hours, after which the liquid is decanted and may be used again. The peas are drained for an hour and then dried in warm air. Haricot beans, lentils, etc., may be similarly treated. Fresh haricot beans or small fresh peas may be treated with the same solution, which is first brought to 60° C. and then kept at 40° C. for 18 hours, after which the mass is washed, drained, stirred, and dried.

484,668. **Cooling chambers.** SEABROOK, J. A. E.

In storing eggs, the eggs are placed in a tank which is enclosed in an insulating casing to provide an inter-mural duct containing a temperature influencing coil which is the evaporator coil of a refrigerating plant, the duct serving for the passage of gaseous cooling medium by way of the coil either through the tank, which has closable apertures in opposite walls, or round the closed tank, the temperature of the gaseous medium being controlled by varying the temperature of the coil. In the form described, when the tank has been charged with eggs, the apertures are opened and a fan, preferably electrically driven, is positioned in each aperture, one or more of which may be provided, and air is circulated over the coil and through the tank till the temperature of the eggs is reduced to about 32° F. The fans are then removed from the tank and placed in a partition and the closures secured over the apertures. Inert or neutral gas—*e.g.*, carbon dioxide or nitrogen—is then supplied to the tank through an inlet, the air being displaced through an outlet, the conduits being closed when the greater part—*e.g.*, 60 per cent. or more—of the air has been replaced. The conduits may be connected outside the casing in a circuit which includes a pump. The storage is then continued while maintaining the circulation of air round the tank.

485,331. **Food preparations.** MILLER, H. W.

Vegetable milk is made directly from whole soya beans by grinding the whole bean with added water to break down its cellular structure, adding suitable essential foodstuffs—namely, a cereal sugar such as glucose or honey—and a vegetable fat such as soya, coconut and/or cottonseed oil, together with salt, cooking the mixture by boiling while agitating it, and passing the cooked mixture through a homogeniser. In the example given, 1 part by weight of the beans, which may be of a hard white or yellow variety, is soaked in 8 parts of water, which is preferably at 60° to 75° F., for 6 to 10 hours and ground to a fine pulp in a burr mill whilst adding a small stream of water. The product is boiled to cook it and strained through a fine cloth, a centrifuge being employed if desired to assist the straining. After adding the foodstuffs the mixture is heated to boiling point with agitation, the boiling being continued for ½ to 1 hour until the product is changed to a nutty flavour. The product is passed through a colloid mill, preferably of the rotating type, and is then cooled and bottled or is pumped direct into the hot-air chambers of a milk-drying machine for conversion into a powder. Vitamins C and D may be added to the milk in any suitable form, together with dextrose and maltose sugars.